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MANUAL

OF

gricultural and Animal Husbandry Development Work

IN

Community Projects

NISTRY OF COMMUNITY DEVELOPMENT

GOVERNMENT OF INDIA

Ag96/1

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IN

Community Projects

PREFACE

The improvement of agriculture and animal husbandry forms a very important part of the development work now being done in the Community Projects and NES Development Blocks The experience of the past two years has brought home the urgent need of a Manual for helping the Project and Block Executive Officers, Agricultural Extension Officials and Village Level Workers in the framing of suitable development programmes. Without such assistance, emphasis has often times been laid on unsuited activities or inadequate importance has been attached to items needing greater attention.

This Manual covers both agricultural and animal husbandry development work since the work under these two heads is closely inter-related and cannot be isolated from each other. In the preparation of the Manual, care has been taken to use as simple language as possible, so that it may be easily intelligible to even the lay reader. The Manual is intended to serve only as a guide in the framing of detailed schemes suited to the conditions actually obtaining in individual Projects and Blocks. Every attempt has been made to mention in the Manual the different items of development work that may be included in a phased programme.

The first edition of the Manual, which was published in August, 1954 has been exhausted, but requests are being received from various States for supply of additional copies. Consequently the publication of the second edition has been found necessary. In issuing the new edition, opportunity has been taken of illustrating it with suitable photographs and appending a summary, a chart of cultivation details of common field crops and a note on the integrated development of individual family holdings. The illustrations now published have been obtained from various sources, the Indian Council of Agricultural Research, the Indian Agricultural Research Institute, New Delhi, the Departments of Agriculture, Uttar Pradesh, Mysore and Madras, and the Community Projects Department, Assam. Their permission to publish the photographs is gratefully acknowledged.

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Introduction

The principal objective of the development work in the Community Projects is to transform the social and economic life of the villages. An urge is to be created in the rural population for a higher standard of living. Instead of being steeped in poverty and leading a life of abject misery. the villager should possess the desire to live better. His diet should be more nutritious, clothing more adequate and housing more sanitary than at present. He and his children should be properly educated and should lead a more social life. All these essentials of better living mean increased expenditure. In order that he may be able to meet this higher expenditure, the villager must earn more income by increased agricultural production and gainful employment in periods of enforced idleness. To achieve increased agricultural production, not only the technique of farming has to be improved comprehensively but also the villager has to work harder and longer. The work of agricultural and animal husbandry development has, therefore, been accorded the place of pride in the Community Development Blocks in the rural areas.

Difficulties in the way

The existing agricultural conditions are not at a uniform stage of development in all the States. Where agricultural development has received proper attention in the past, agricultural methods are much more advanced and farmers are in a better economic condition than in States in which agricultural development has been more or less neglected. The work of agricultural improvement in relatively backward States, therefore, is beset with many difficulties and hurdles. Adequate development staff is not available. Much of the personnel that has been appointed for development work in the field has not received the basic training in agriculture or has received only an inadequate training. Similarly, the supplies of improved seed, fruit plants, manures, insecticides, implements and other equipment are not forthcoming in required quantity or number. Some of the machinery, such as tractors and ancillary appliances, remains yet to be received. Even arrangements for the transport, storing and distribution of seeds, manures and other materials are highly defective. In many areas, the general run of cultivatiors does not possess funds to finance development work or purchase the needed materials, and the governmental or co-operative arrangements for short-term financing are simply non-existent. Add to these the cultivators' aversion to run risks seemingly attendant on any new practice, seed or manure recommended to him, and we have a fairly complete picture of the difficulties that one has to contend with in improvement work on a large scale. However this does not mean that nothing can be done for improving agriculture or increasing agricultural production. The difficulties enumerated above only indicate the vastness of the task and the need for meticulous planning. They also point to the need for timely provision of adequate supplies, services and short-term finance.

Planning for Development

Starting agricultural development work without a carefully thought out plan is the surest way of courting failure. For the preparation of a sound plan and detailed programme, a survey of the existing agricultural conditions and the available resources is essential. A basic survey of this kind will indicate (1) the problems requiring attention, (2) the lines of work that may profitably be assigned the first priority, and (3) the extent of the improvement that may be attempted annually under each item of development and for over-all production. On the basis of this information, different items of work should be selected, an order of priority assigned to each and annual or monthly targets laid down. Attention should, in the first instance, be focussed on such items of work as would meet the most urgently felt local needs and are at the same time likely to produce the maximum good from the available resources in the shortest possible time. Frittering away of resources should be avoided at all costs.

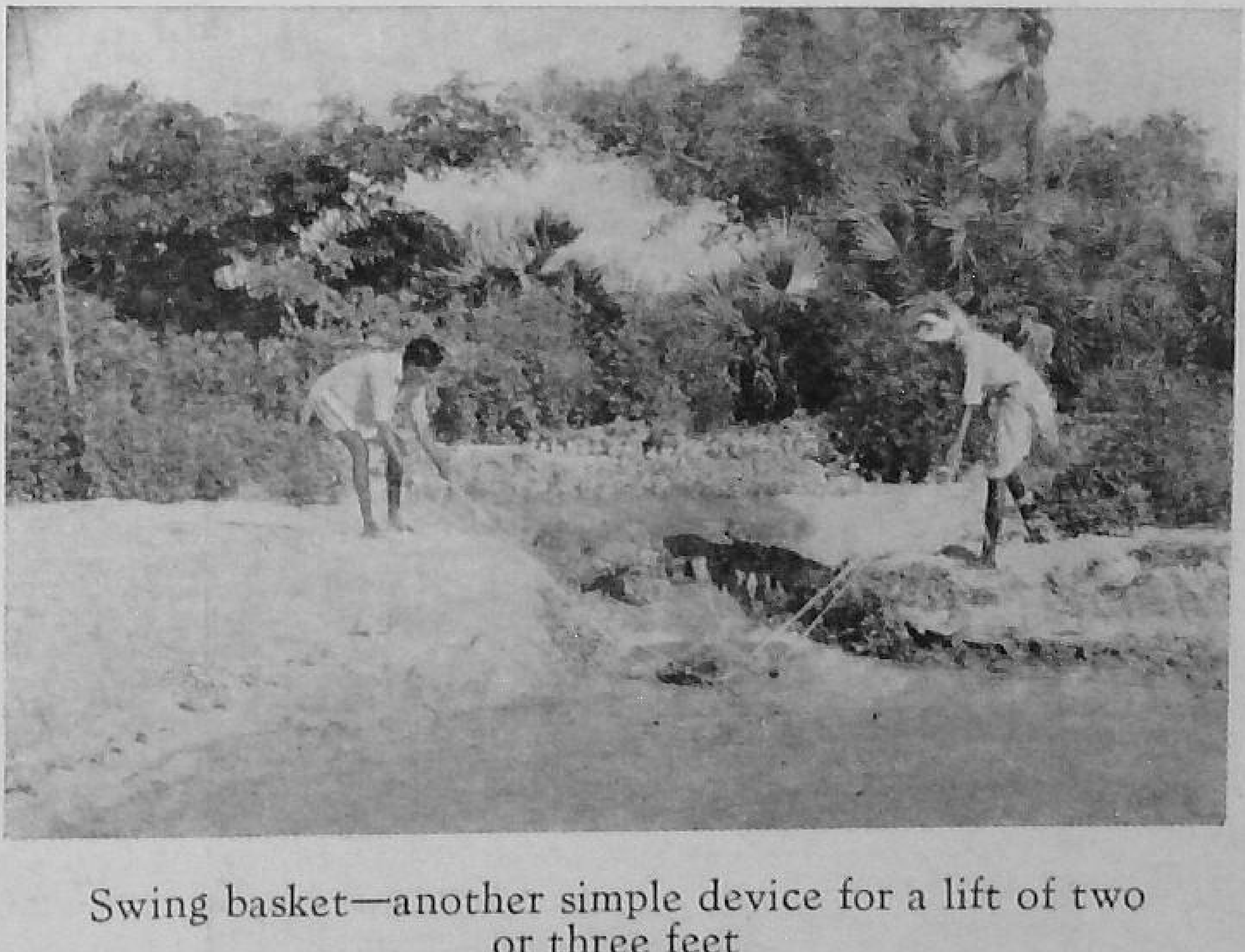
The annual targets fixed for a Project or Block as a whole should be split up into targets for individual villages or groups of villages as soon as possible. When the development work has progressed for some time, plans should be prepared for individual farmers to improve their economic condition by suitably amending their cropping schemes and agricultural technique. If possible, monthly schedules of operations should be laid down for each cultivating family.

Principal Items in Development Programme

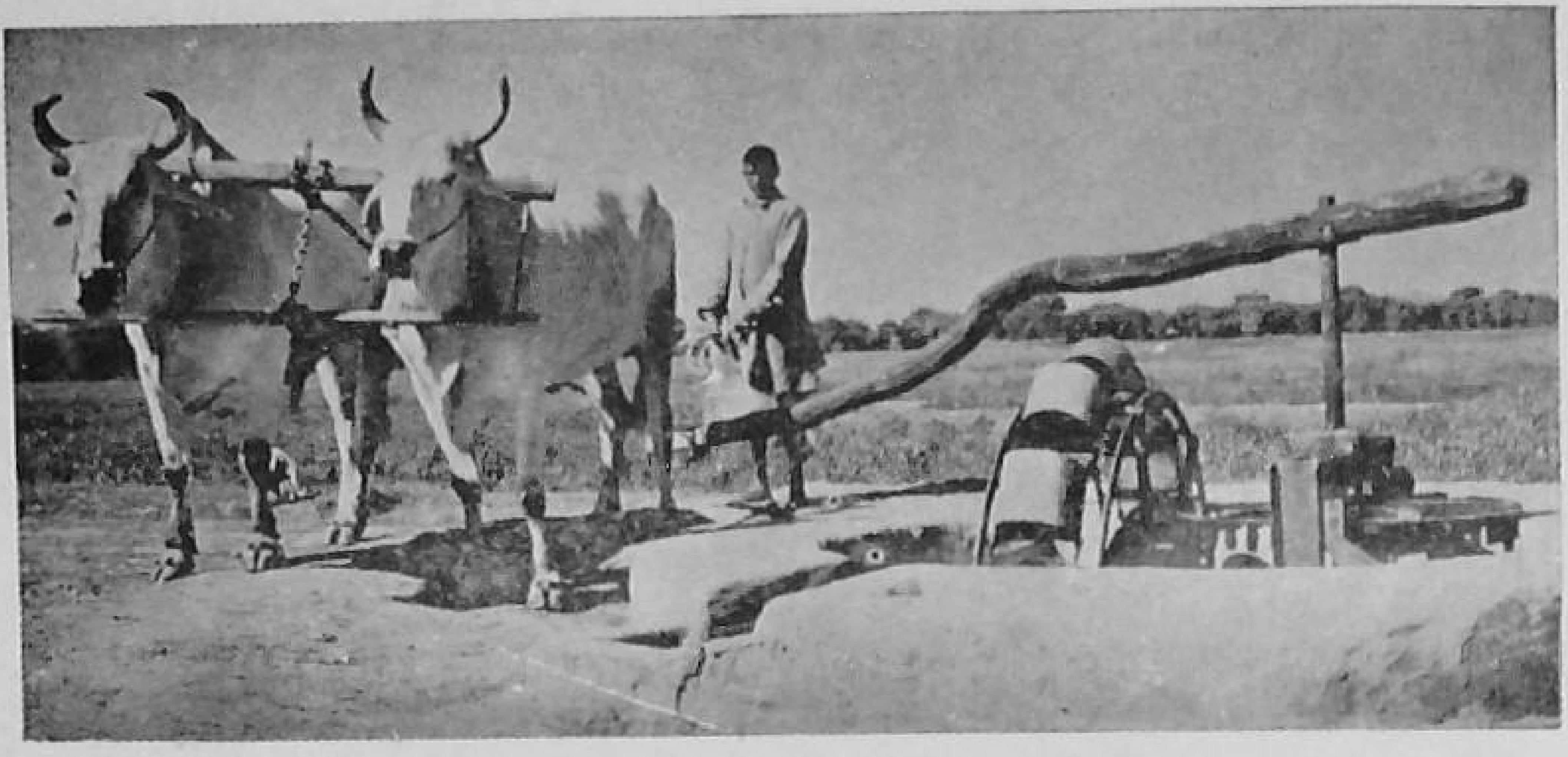
Owing to widely varying conditions of soil and climate and large differences in the level of agricultural development, no uniform programme of agricultural improvement can be prescribed for the country as a whole. The programme for each State or Project should be framed so as to include only such items as are best suited to the local conditions and are in conformity with the needs of the bulk of the farmers. As stated already, emphasis should be laid on and preference given to such activities as are likely to produce the most outstanding results in the shortest possible time. Subject to these observations, general suggestions for the framing of concrete development programmes are offered in the paragraphs below.

(1) **Extension of irrigation facilities** :—Farming in a major part of India is wholly dependent on rain, which is received in the limited period of 3 or 4 months constituting the monsoon season. The vagaries of the rainy season are too well known to need reiteration. Too much of rain or too little of it, as also its untimeliness or general bad distribution—all have ill effects on the fortunes of farming. The seasonal character of rains is also responsible for much of the land growing only one crop in the year. Provision of irrigation facilities in the dry season after the rains or during long breaks in the rainy season will pay the best dividends. It will permit double cropping, on the one hand and save crops from partial or total failure, on the other.

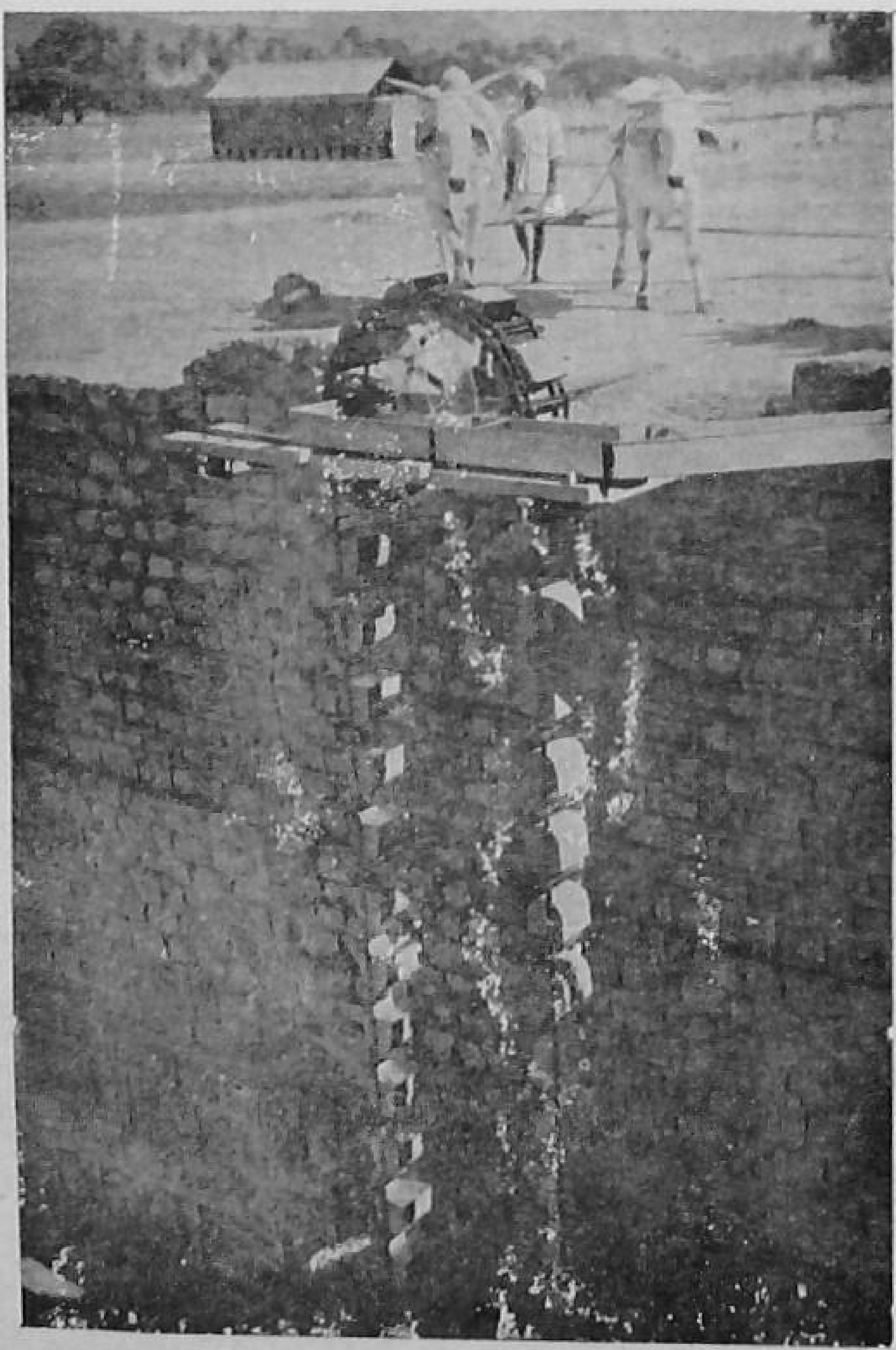
Don—a simple waterlift in common use in Bihar



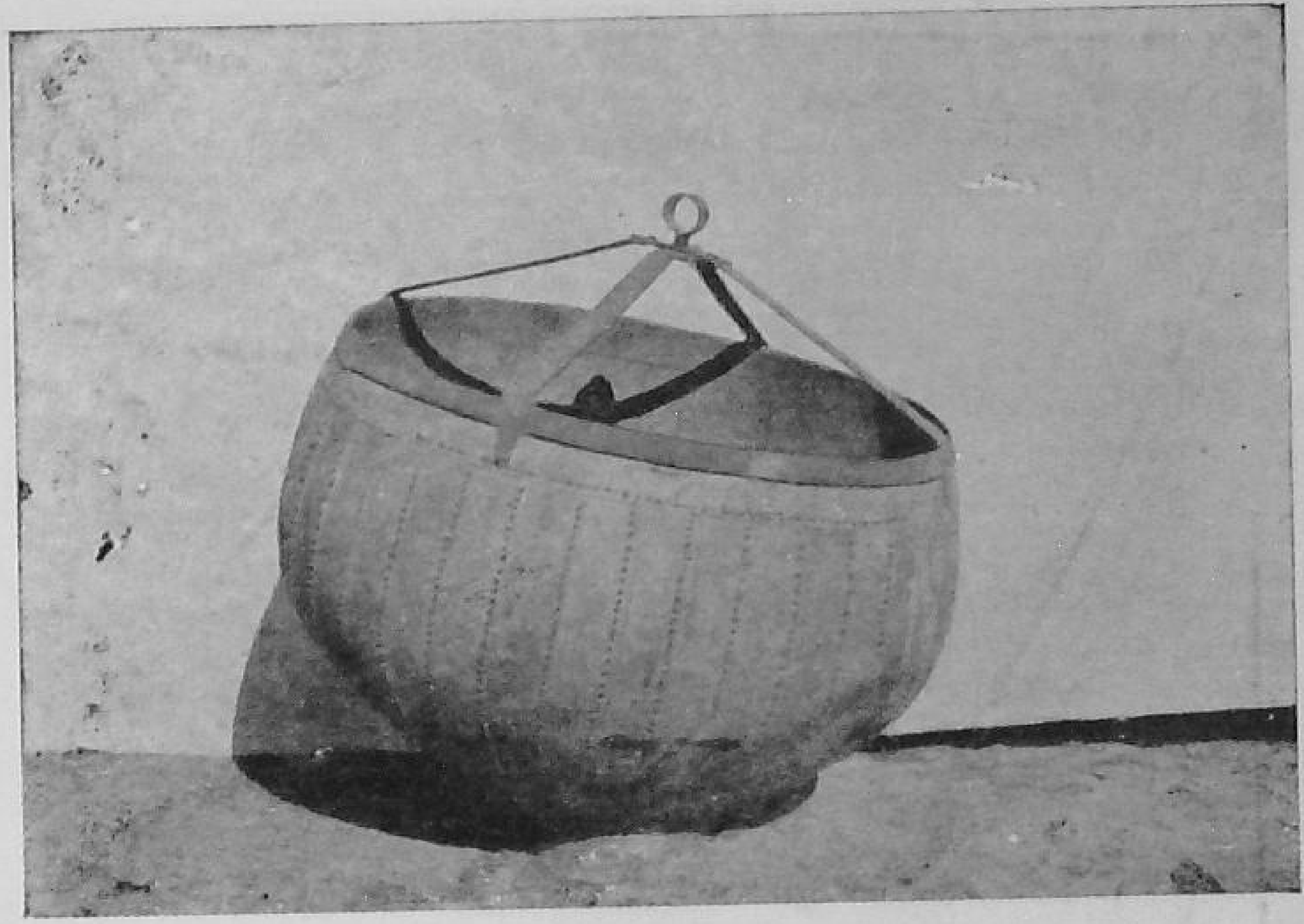
Swing basket—another simple device for a lift of two or three feet



Rahat or Persian Wheel



Persian wheel (showing chain of buckets inside the well)

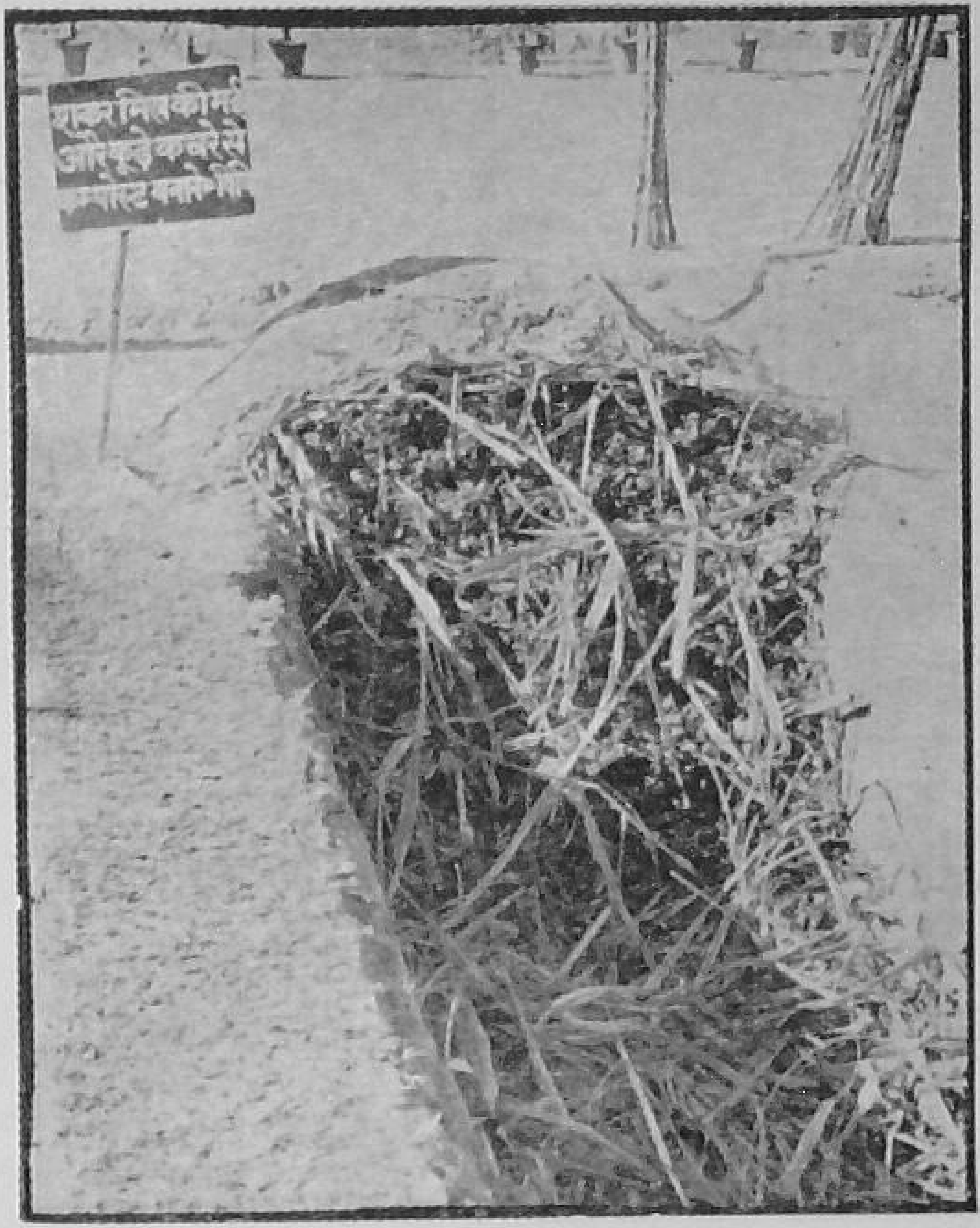


A "Mhote" bucket used for lifting water in central and southern part of India

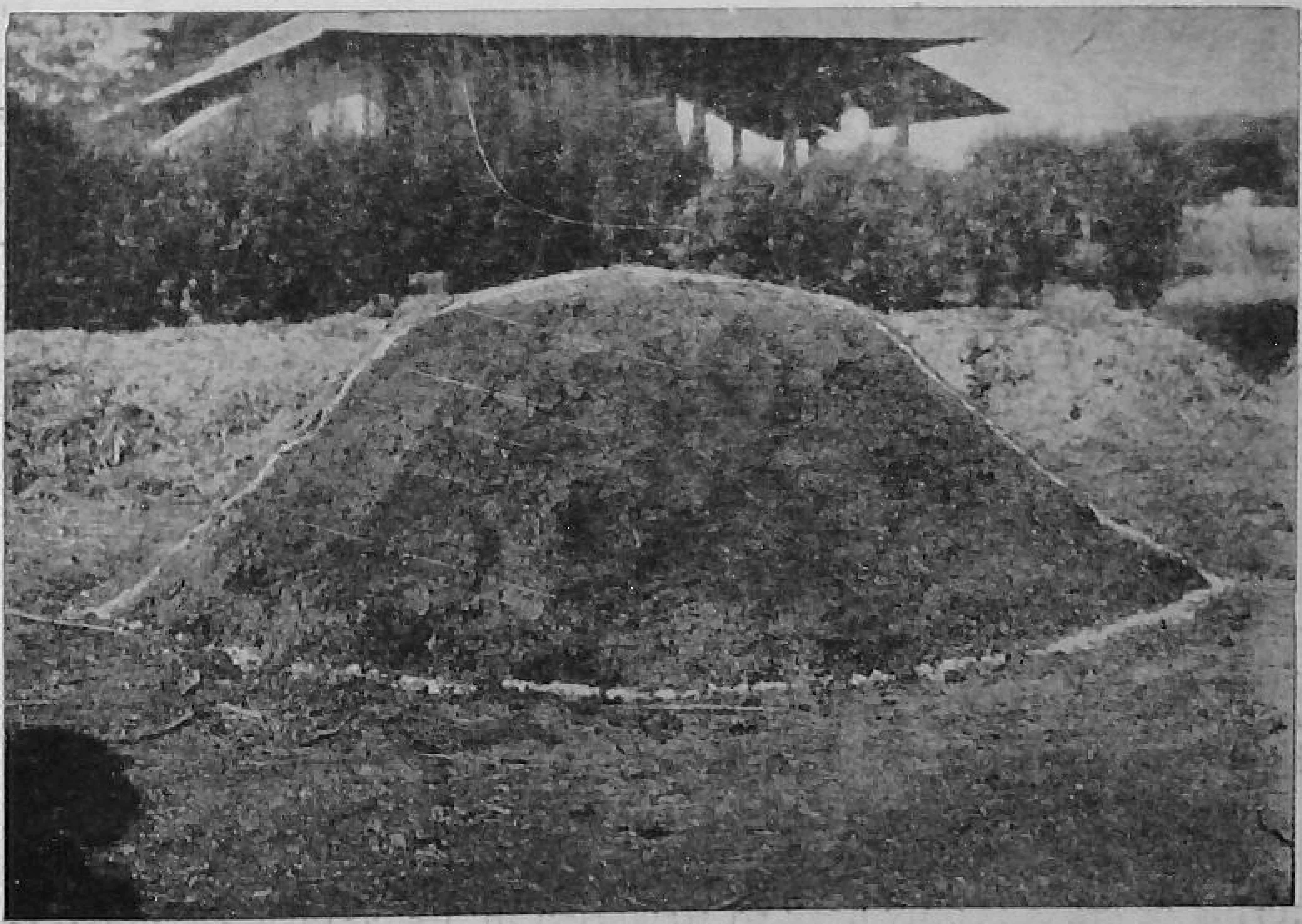
"Mhotes" lifting water from an open well

Drilling a tubewell for irrigation purposes in Uttar Pradesh

Irrigated with a filter point



Composting farm weeds and stubbles



Compost pit filled and plastered with mud and cow-dung

Farmers in all parts of the country are anxious for the provision or extension of irrigation facilities. Even the most backward cultivator knows that irrigation of crops increases the yield two-fold or more. Cultivators are also aware that the maximum benefit of manuring is reaped from irrigated crops. Therefore, in agricultural development work in most of the States top-most priority should be given to the provision of irrigation facilities. The major irrigation projects which require large funds, materials and equipment for their construction, are the responsibility of the Central and State Governments. The irrigation programme of individual Projects and development Blocks should include such minor schemes as construction, repair and deepening of surface wells; construction and repair of tanks, canals and Kuhls ; construction of tubewells ; putting up of *bandharas*, anicuts or diversion weirs at suitable points on streams and *nalas*, direct pumping from perennial streams and rivers ; and supply of oil engines, electric motors, pumps, Persian wheels and other water lifting appliances. Necessary financial and other help should be provided for constructional work as well as water-lifting appliances. The demonstration of and instruction in the proper technique of double cropping in particular and of growing irrigated crops in general should form integral parts of this development programme.

The targets for the sinking of new wells and repair of old ones fixed under the 'Grow-More-Food' and other schemes already in operation in the Community Project areas should be expanded and the work completed in the shortest possible time. The repair of old wells should include deepening, and boring to augment their water supplies. For sinking new wells, preference should be given to villages with known supplies of abundant water in the sub-soil. Many Projects are traversed by streams in which good irrigation water flows for several months in the dry season after the monsoon rains. Wells should be sunk along the banks of such streams wherever suitable land is available for growing irrigated crops. These sump wells will usually yield much larger quantities of water than ordinary percolation wells ; they should be connected directly with the stream by a temporary or permanent channel. A rapid survey should be carried out to locate suitable sites for sump wells. As regards the installation of oil engines, electric motors and pumps, care should be taken to ensure that only such farmers are given assistance in this connection as have adequate supplies of water in their wells. Installation of irrigation pumps on wells with inadequate supplies of water means waste of capital as well as machinery. In localities where specially large quantities of water are available in a stream during a greater part of the year, an effort should be made to organise co-operative lift-irrigation societies. The possibilities of pumping direct from perennial streams and establishing Government pumping stations for the purpose should also be explored. In construction of tanks, preference should be given to those that can irrigate at least 50 to 60 acres. Furthermore, proper arrangements should be made for the expeditious development of land which may be brought under tank or canal irrigation.

2. **Greater use of manures and fertilizers.**—The proper manuring of crops is only next to irrigation in its ability to increase

the yield per acre. The minimum additional yield on this account may safely be placed at 25 to 35 per cent. In the case of irrigated crops, the extra yield resulting from the use of manures is still more. The supply and use of manures should, therefore, receive the utmost attention.

The use of cattle dung and stable refuse as manure for crops is a hoary practice. Cultivators are convinced of the utility of farmyard manure and yet utilise a good portion of it as fuel. The burning of cattle dung is almost a universal practice in the country. It is estimated that nearly half of the farmyard manure produced annually is destroyed in this manner. While destruction of farmyard manure has gone on unhampered, little attempt has been made until recently for increasing local manurial resources by the composting of farm, house and cattle shed wastes. In many parts of the country, cattle dung, stable waste and house sweepings are first heaped in the backyard, and when about a cartload has been collected in this manner, it is then removed to another heap in a common plot outside the village, where other farmers also dump their manure in like manner. The cattle dung, the organic matter in the house sweepings and the remains of the plant stalks fed to cattle dry up and do not properly rot. This uncomposted material lies fully exposed to the action of sun and rain and often a good part of the dry dung is lost by being blown away by wind. This loss can be avoided and good quality manure can be produced, if every farmer is made to provide himself with one or more compost pits and he is given the necessary training in the composting of cattle dung and farm and house refuse. Demonstration of and instruction in the proper method of composting farm and house refuse and propaganda for the digging and filling of compost pits in rural areas should be taken up on a large scale. Targets for the number of pits to be dug should be achieved in the very first year. Special campaigns should be organised in October or some other suitable month for the filling of compost pits with farm wastes, tree leaves, weeds and cattle dung. In hill tracts and during the rainy season, compost may be prepared in above ground heaps. Cattle urine, which is a valuable manure, is at present almost wholly wasted. The utilisation of cattle urine as manure should also be demonstrated and encouraged. The systematic composting of town refuse, human excreta and urine by the municipalities and town committees should be organised. Green manuring for irrigated crops or crops grown under high rainfall conditions should be encouraged by supplying green manure seeds and seedlings at concession rates and imparting instruction in the technique of growing the green-manure crops and subsequently burying them in the soil. Planting of *Glyricidia, Sesbania Speciosa, Pongamia, Tephrosia, Karanj* and other trees yielding large quantities of leaves for use as green manure for paddy should be popularised in paddy growing areas. Use of bone meal and inedible oil cakes as manure should also be propagated. Tank-bed silt and slaughter house wastes are also useful manures, available locally in many places. The use of cattle dung as fuel should be actively discouraged by advocating and assisting the extensive planting of quick growing trees like *Babool*, Casuarina, Mequite, *Ailanthus excelsis*, which will provide an alternative fuel. Wherever possible, arrangements may be made for supplying cheap

quality coal to replace the burning of cattle dung. These measures will augment the local resources of farmyard manure a great deal.

In view of the inadequacy of local manures, the use of chemical fertilizers like ammonium sulphate, superphosphate, ammonium phosphate, urea, etc., should be advocated. Their use should be recommended more particularly for paddy, sugarcane, irrigated wheat, vegetables, fruits and other garden crops, which give a high response to concentrated manures and usually produce good income. The fertilizers may also be popularised for use on crops grown in high rainfall areas. The proper dose of fertilizer for each crop and the method and time of applying it should be demonstrated on a large scale in consultation with the local Department of Agriculture The 3-plot technique of demonstration should be adopted, the central plot receiving the recommended fertilizer, and the two side plots, the cultivator's normal manurial treatment. The chemical fertilizers should be used generally in conjunction with the locally available organic manures. In some States, the Agricultural Departments recommend the use of manure mixtures containing chemical fertilizers and organic manures like oil cakes and bonemeal in specified proportions. The multipurpose co-operative societies should be made responsible for purchasing, transporting, and storing the recommended fertilizer mixtures and supplying the same on short-term credit to farmers.

3. **Sowing of improved crop varieties**: - One of the principal causes of the existing low yields of most of the crops grown in the country is the use of unimproved non-descript seed. The growing of the seed of improved varieties is one of the easiest method of expanding production. At little or no additional cost the yield can be increased by about 10 to 20 per cent by this means. Although crop improvement work has been in progress for many years under the aegis of the State Departments of Agriculture, yet the area under improved seed (excepting that of the cash crops) is very limited in many parts of the country. There is a great need for improvement in this connection.

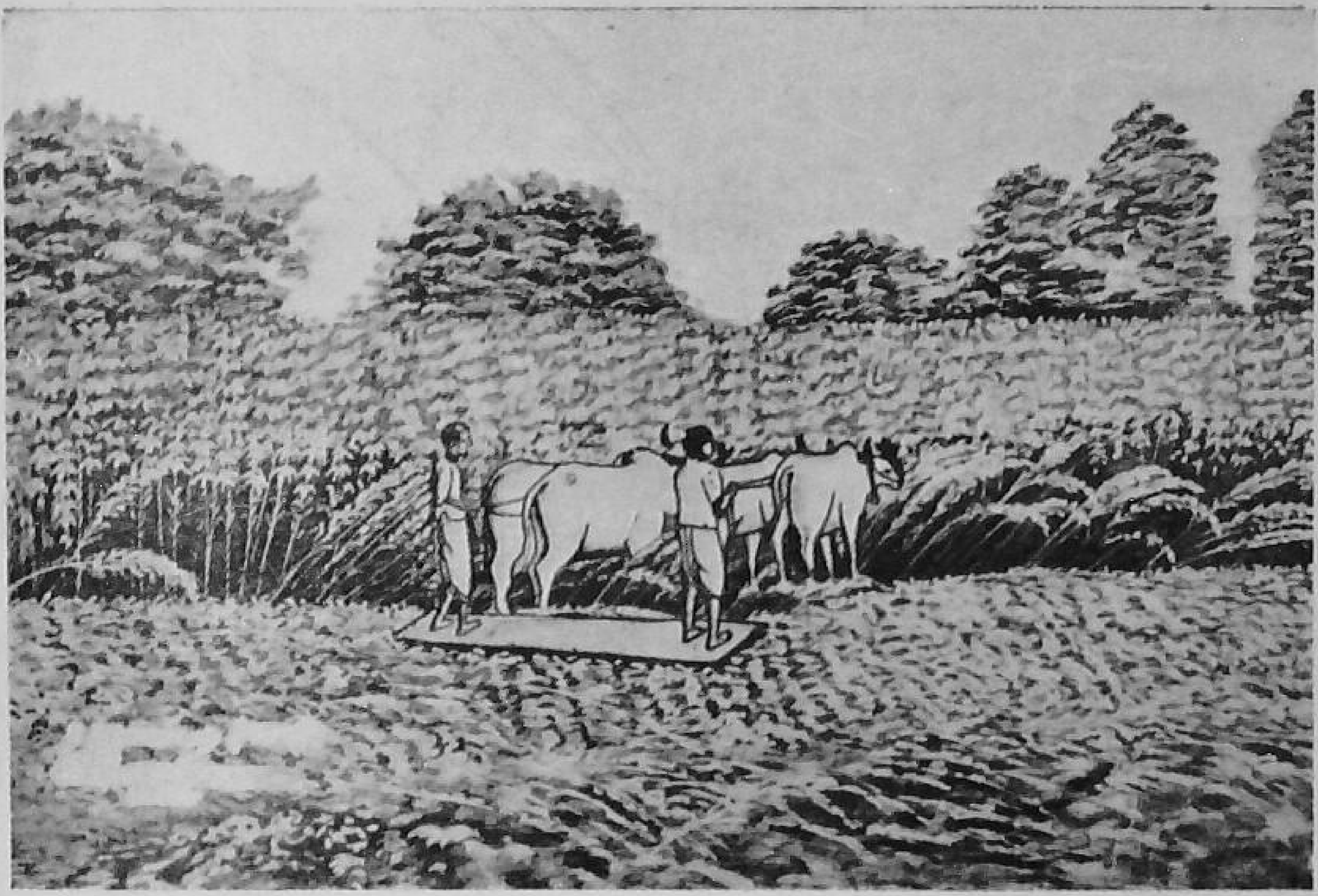
Improved varieties of different crops are now available for most of the Project areas in at least some of the States. The principal steps for the wholesale replacement of ordinary unimproved seed by that of an improved variety are the following :—

1. Setting up of demonstration plots of improved varieties in the cultivators' fields ;

2. Procurement of 'nucleus' supplies of pure seed of improved varieties from the Department of Agriculture and its multiplication under most favourable conditions of cultivation in 'nucleus' villages ;

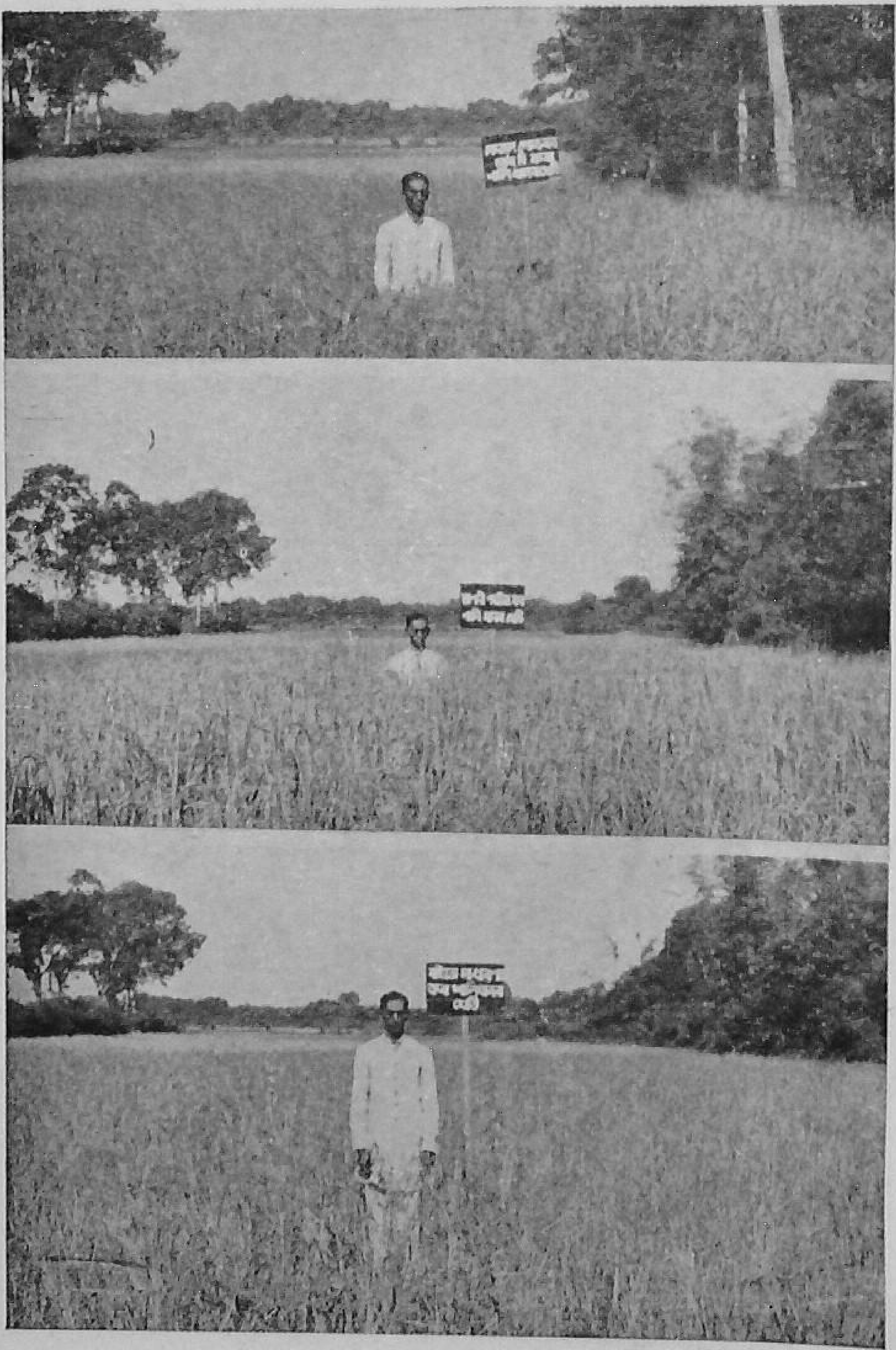
3. Collection and stocking of seed produced in 'nucleus' villages ;

4. Distribution of seed obtained from 'nucleus' villages to farmers of surrounding villages.



Felling green manure crop (sunn-hemp) before ploughing into the soil

Wheat crop on green manured land



Unmanured crop of paddy (*bottom*) compared with the crop manured with compost (*top*) and with Ammonium Sulphate and Superphosphate (*centre*) in Assam

The demonstration of the improved variety in cultivators' fields should be carried out by the 3-plots demonstration method. The size of the field selected for setting up demonstration plots will vary according to crop grown and the size of the field available. As far as possible, select a field of one acre. In no case should the selected field be less than 1/5th of an acre in size. The selected field should belong to one and the same grower and it should have been under one and the same crop in the previous season. The selected field should be divided into 3 equal sized plots. The central plot should be grown with the improved variety proposed to be demonstrated and each of the side plots should be grown with the local variety already in cultivation. The 3 sub-plots should be sown on the same day and should receive the normal cultivation, manurial or irrigation treatment. Sound seed of both the improved and the local variety should be used and every effort should be made to obtain a good stand in all the three sub-plots. At the end of the season, all the 3 plots should be harvested separately and the yield of the improved variety in the central plot should be compared with the average yield of the local variety in the two side plots. This arrangement will also provide an excellent visual demonstration of the comparative growth of the crop of the improved variety and the local variety. Arrangements should be made once or twice in the season for showing the crop of the demonstration plots to cultivators living in the village. Occular demonstration of this kind will convince the farmers of the advantages of growing improved varieties.

Demonstration of the improved variety should be divorced from the multiplication of its pure seed. For purposes of seed multiplication, pure 'nucleus' seed should be obtained from the Department of Agriculture concerned. In the case of the predominantly self-pollinating crops of the paddy, wheat, barley and gram, or of those that are propagated from cuttings and tubers, such as, sugarcane and potato, the nucleus seed or the planting material may be supplied to any given village or centre only once in 3 or 4 years. In the case of the cross-pollinating crops like *jowar*, *bajra*, *castor*, etc., fresh supply of nucleus seed should be made every year. This nucleus seed should be sown in 3 or 4 'nucleus' villages suitably distributed in the Block. Each such village should have a multi-purpose co-operative society, which should purchase the nucleus seed from the Department of Agriculture and arrange for its multiplication in the 'nucleus' village. The seed should be sown in compact blocks of well-manured land under irrigation and given the best cultivation treatment and protected against attacks of insects, pests and diseases. In the case of paddy, the Japanese method of cultivation should be adopted. 'Raised bed' nurseries may be established under irrigation from tanks or wells and the seedings may be supplied to the farmers of the three or four villages selected for the concentrated multiplication of 'nucleus' seed. Similarly, the multiplication of nucleus seed of improved varieties of wheat, gram, barley, cotton, castor and other crops should be carried out by sowing the seed in properly spaced rows and seed holes. The multiplication of seed in compact blocks in a few villages will facilitate technical supervision, and the adoption of improved methods of cultivation will mean both economy of seed and a very rapid rate of seed multiplication. The crop in the nucleus

villages should be inspected in the field for purity, and all 'off-type' plants should be removed.

Usual successive stages in the multiplication of Improved Seeds are as follows :

I Stage :	Multiplication of nucleus seed obtained from Agriculture Department in compact blocks in one or two villages in the Project under good conditions of cultivation and manuring.
II Stage :	Multiplication of seed from Ist stage under good conditions of cultivations at the headquarter of each Gram Sewak.
III Stage :	Covering of entire area of each Gram Sewak's headquarter village with the seed from 2nd stage.
Saturation Stage :	Saturation of the remaining villages of each Gram Sewak with the seed from the 3rd stage.

The multipurpose co-operative society should buy back, transport and stock the seed produced in the nucleus village, and arrange its distribution in the ten to fifteen surrounding villages in the following year. It should also provide short term credit to farmers purchasing the seed. The supervisory staff of the Project will have to take special interest in the first one or two years to ensure the efficient handling of this work by the multipurpose co-operative societies. The successful working of such societies right from the start is essential for the success of the arrangements suggested for the multiplication of improved seed. Pending the efficient working of a multipurpose co-operative society, the seed multiplication and distribution work should continue to remain the duty of the State Department of Agriculture. In this case, the Village Level Workers should collect indents for improved seed and communicate the same to the local Agricultural Department Store, the actual supply being made on cash or short-term credit by the agricultural staff. Programme of the multiplication and distribution should be so framed that the entire area under a crop is saturated with improved seed in two or three years.

In order to ensure universal cultivation of improved varieties and maintenance of their purity, the application of Pure Seeds and Seedlings Act has sometimes to be restored to. Under this Act, groups of villages or compact areas are notified for compulsory cultivation of superior varieties approved by the Agricultural Department, and penalties are provided for the infringement of the Act. If no improved variety is available for recommendation in any given Project, and supplies of seed have to be made due to crop failure in the previous season, great care should be taken to ensure that the seed proposed to be supplied is sound and possesses good germination capacity. In all such cases, the germination percentage of the selected seed should be determined beforehand.

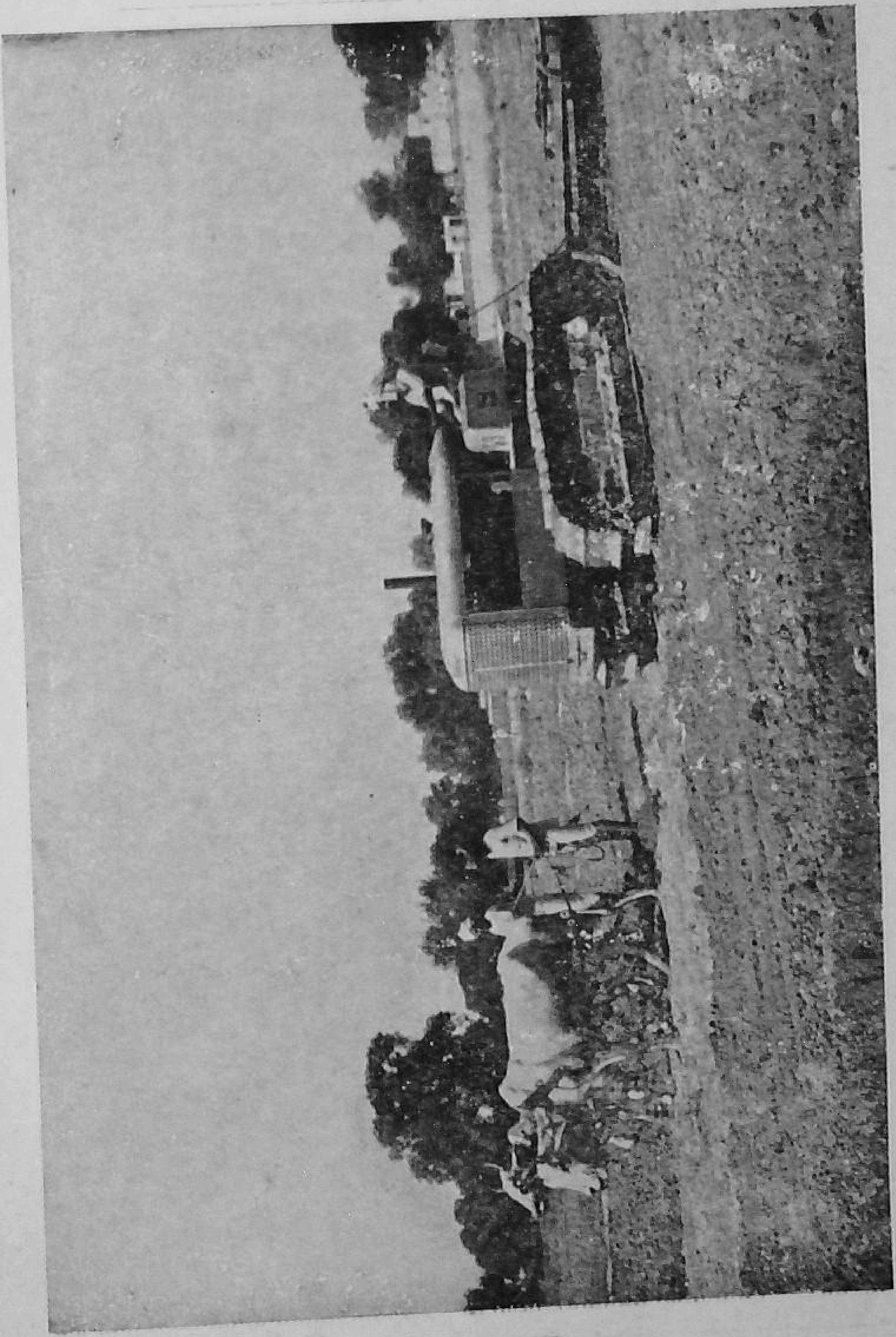
Normally, no unimproved market seed should be distributed. The use of ordinary mixed seed purchased from the market will not

Co. 313—an improved variety of sugarcane

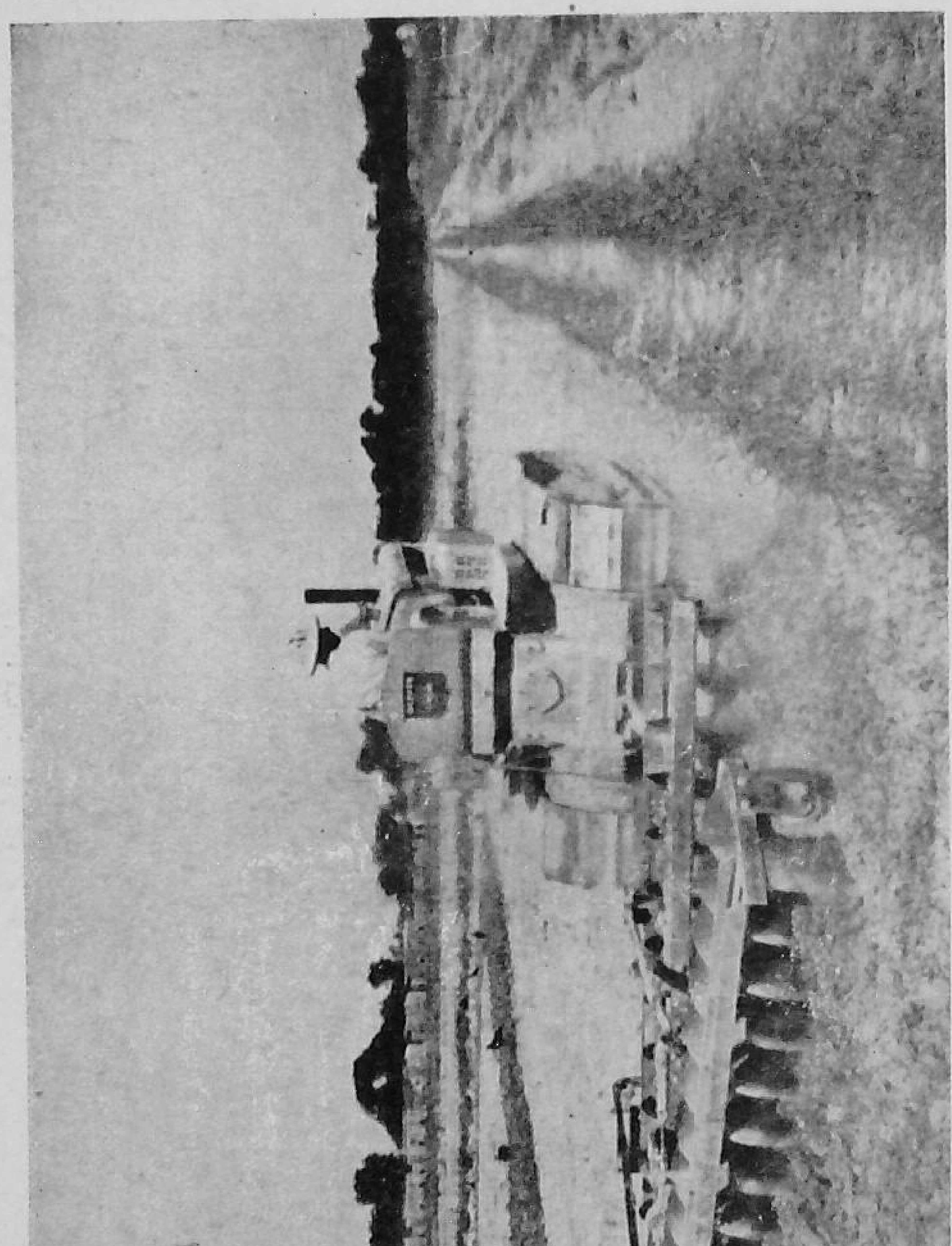
Crop of an improved variety of wheat

Desi plough

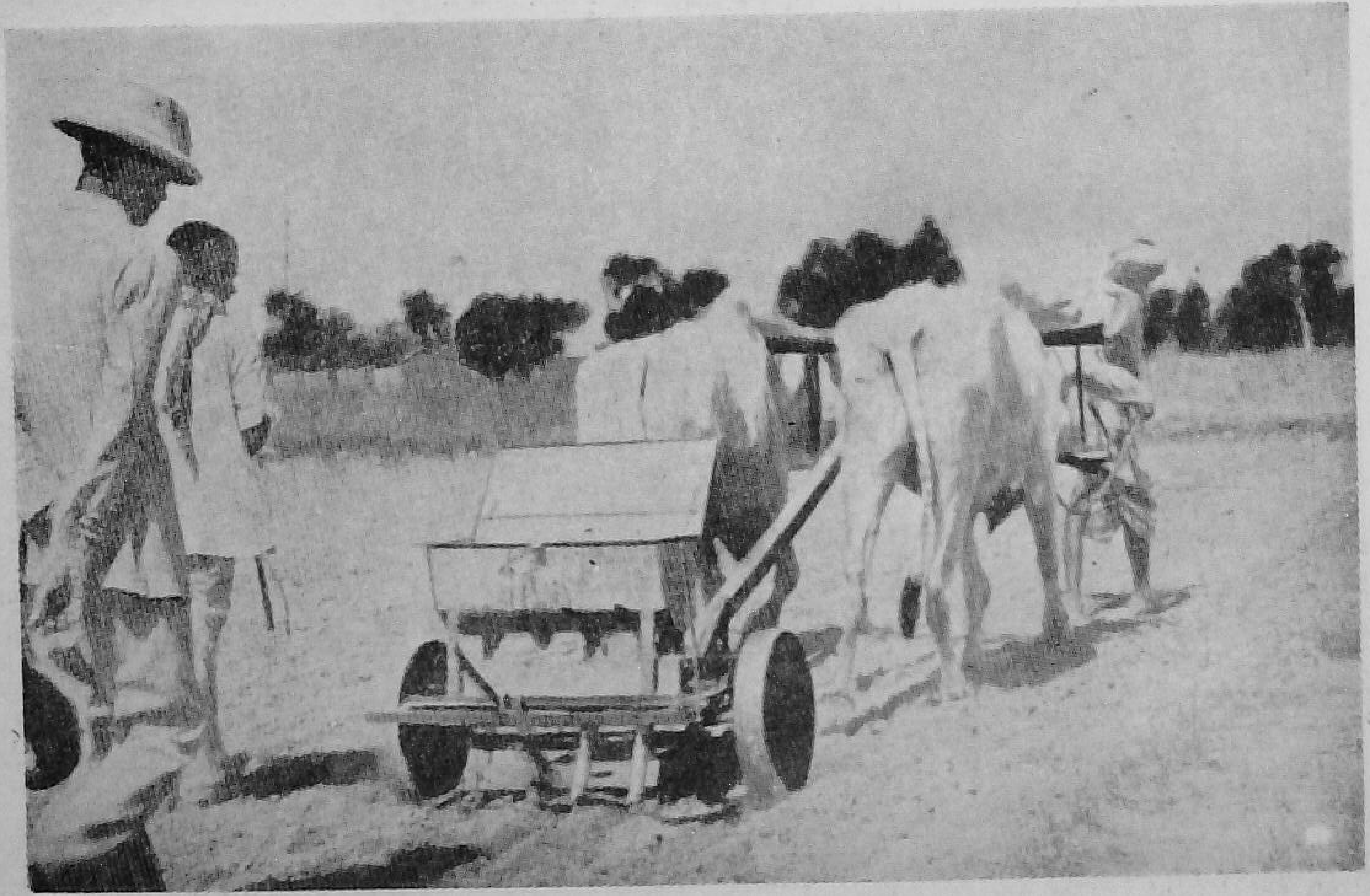
Ridging plough at work



Old and the New
(cold crushing)

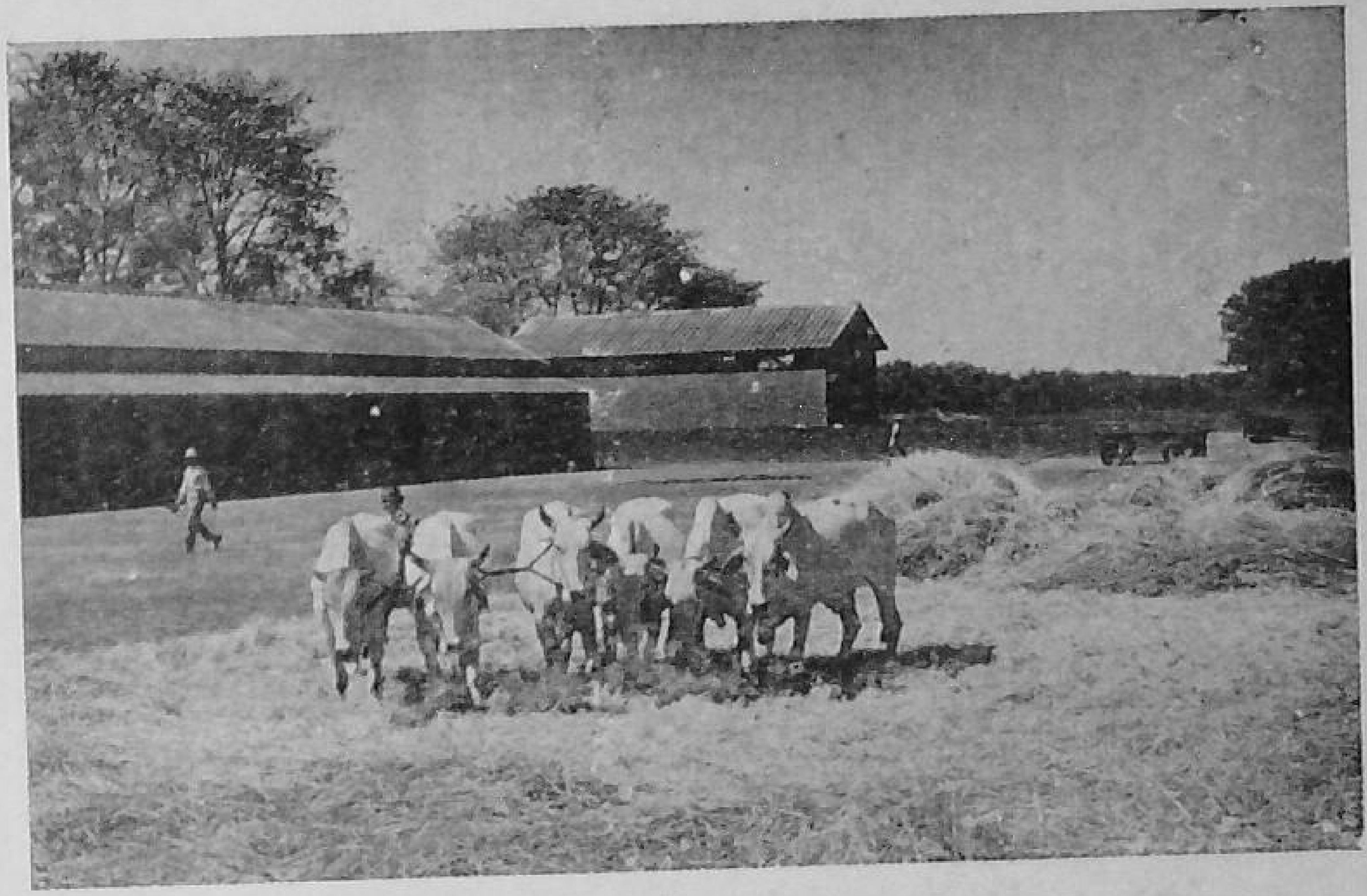


Disc—harrowing with tractor



Improved seed-drill operated by bullock power

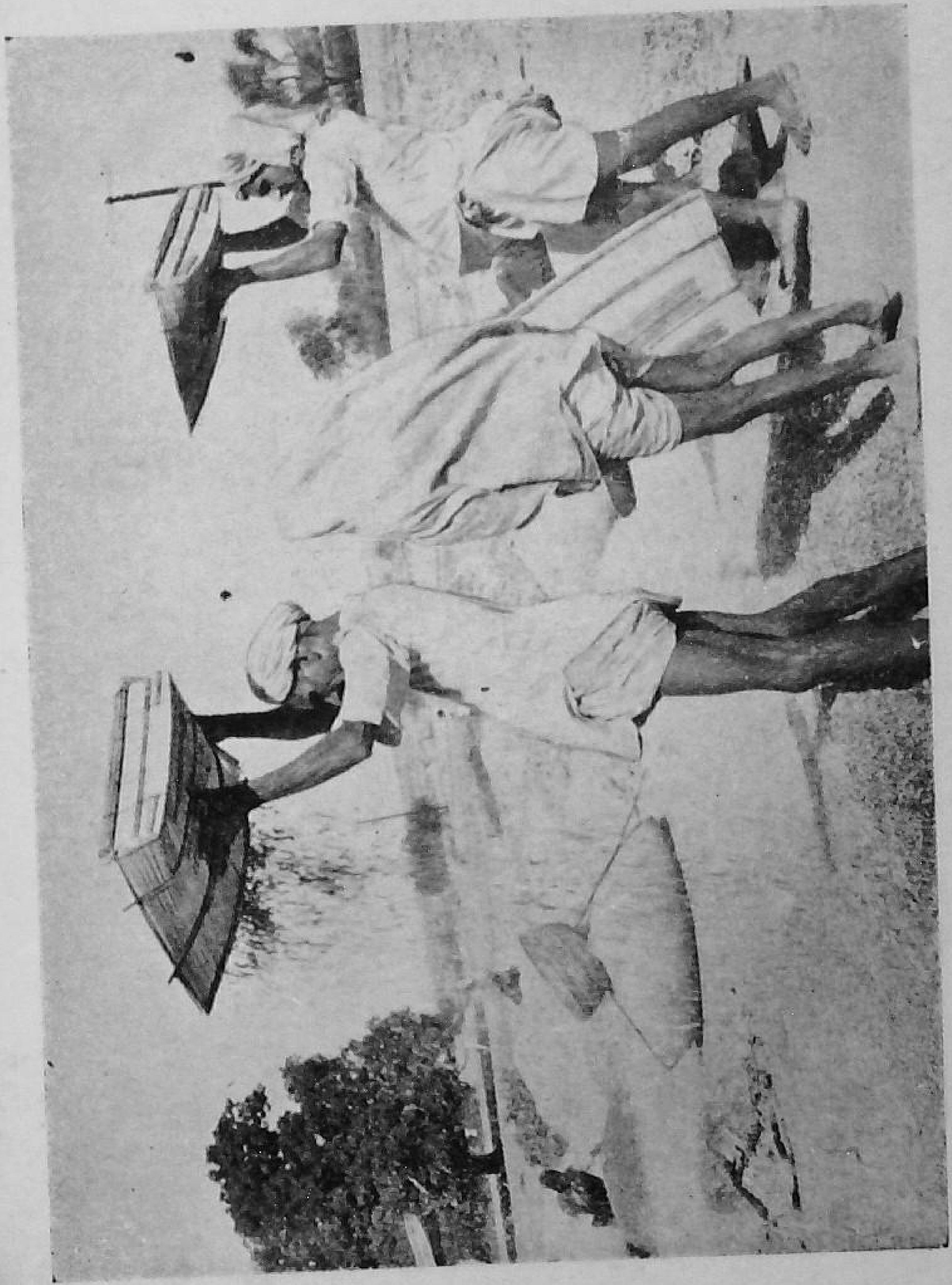
Sowing seed and placing in furrows made by *desi* plough



Threshing under bullocks' feet

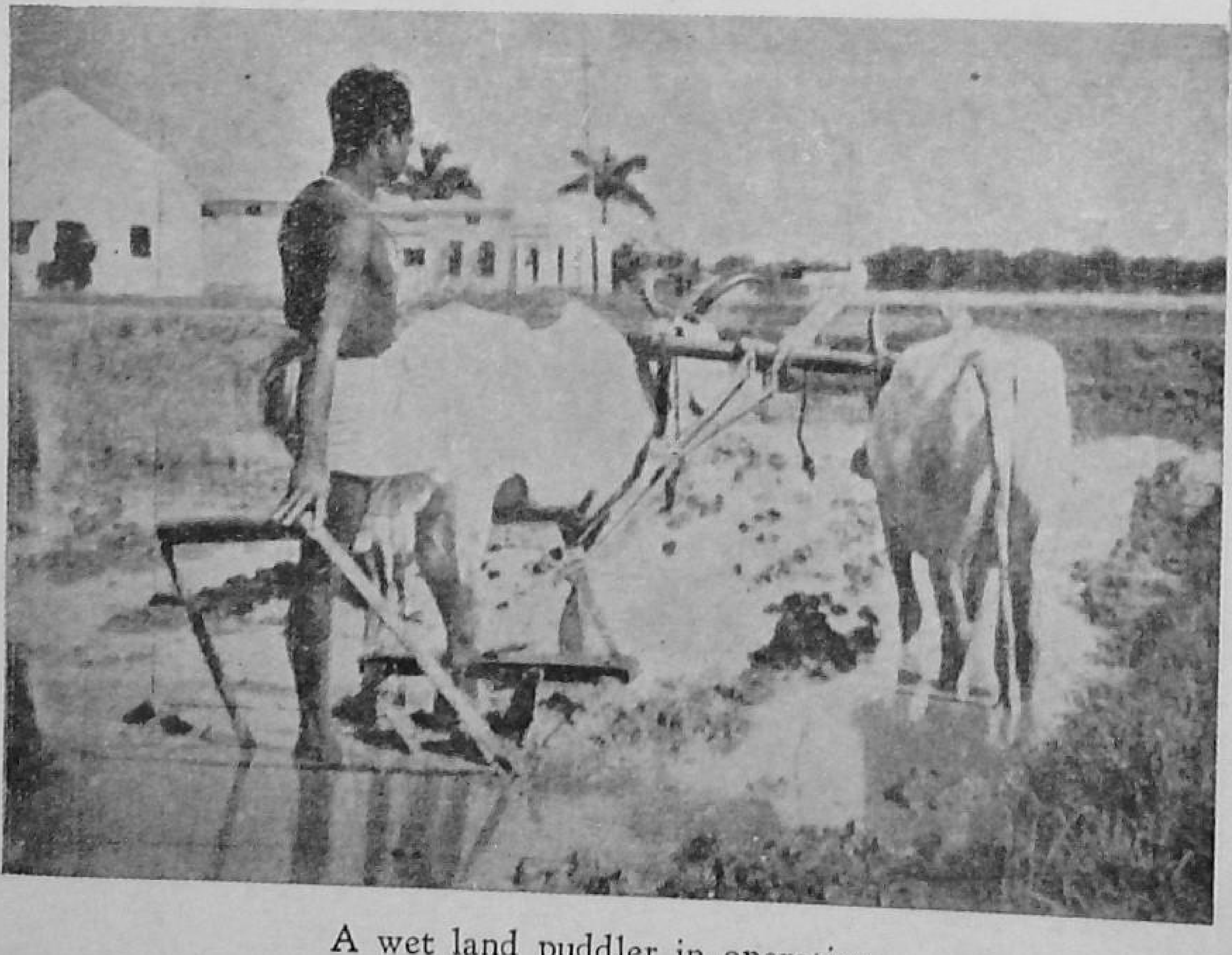
An 'Olpad' thresher worked by one pair of bullocks

Threshing wheat with a tractor-drawn disc harrow



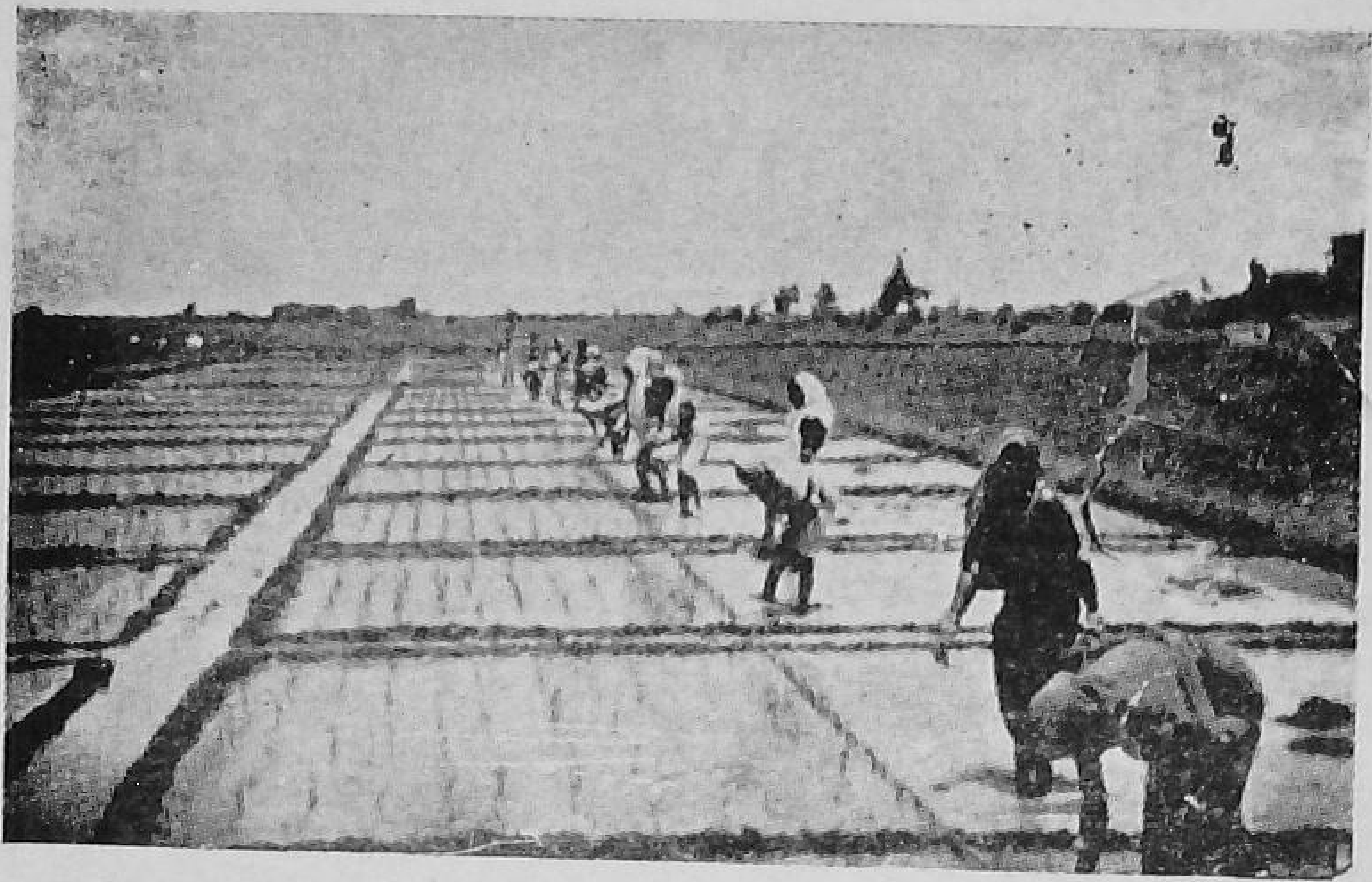
Winnowing

Raised bed paddy nursery



A wet land puddler in operation

Explaining the new way to old farmers



Transplanting of paddy seedlings by Japanese method

Intercultivating paddy field with Japanese hoe

lead to increased production. Where improved seed is not available, increased production should be obtained by the application of other measures of intensive cultivation, such as, irrigation, manuring, protection against insect pests and plant diseases.

4. **Improvement of agricultural technique and land utilisation**:—The existing cultivation practices and land utilisation are not always satisfactory. Defective agricultural technique and improper land use are also partially responsible for low crop yields. The existing rotational practices and the methods of preparation of and sowing of seed, interculture of crop, manuring, irrigation, etc. usually leave much to be desired. Similarly, very little attention is paid to the protection of crops against plant diseases and insect pests. Often times crops needing fertile or well-drained soils are grown on marginal lands, or on land suffering from defective drainage. As a result of the faulty methods of cultivation, defective handling of stored produce or improper use of land, much economic loss is caused annually. For obtaining increased production, improvement of agricultural technique and land use is urgently needed.

In some places, land is planted with one and the same crop year after year. In one locality it may be cotton, in another tobacco and yet another potatoes and in still others *jowar*, *bajra* or wheat. Growing of the same crop year after year not only impoverishes the soil but it also encourages the growth of insect pests and plant diseases. The introduction of improved rotation, providing for the growing of different crops in successive seasons, and more particularly the introduction of one or more leguminous crops in the rotation, will produce beneficial results. Introduction of groundnut crop in the rotation increased the yield of cotton crop by 15 to 20 per cent in many parts of Madhya Pradesh, Bombay and Hyderabad State. Similar results have been obtained by the mixed cropping of cereal crops with pulses in places where cereals were grown as a pure crop only.

In many parts of the country, preparation of land is haphazard and hurried. Land is ploughed only once in three or four years and often it receives no cultivation after the harvesting of *rabi* crops until the first showers of rain are received in the following monsoon. Ploughing immediately after harvest and repeated cultivation of land in summer usually proves beneficial. Repeated cultivation produces better tilth and thereby encourages crop growth and increases yield.

In tracts where broadcast sowing is commonly practised, a high seed rate is used. The over-crowding of plants in broadcast crops affects plant growth adversely and reduces the ultimate yield. Sowing of the crops in lines will mean economy of seed, more uniform spacing and stand of plants and easier interculture. Bullock operated seed drills and hoes can be used for line-sown crops. Thus line sowing increases the yield on the one hand and affects economy in seed-rate and the cost of interculture, on the other.

The proper method of placing manure in the soil and the correct time and dose of fertilizer application are necessary for obtaining the

best yields. Similarly, the proper technique of irrigation is needed for obtaining the best results. Both over-watering and inadequate watering affect the crop yield adversely. Irrigation of large, uneven plots needs more time. It also causes unnecessary accumulation of water at some spots and inadequate watering of the crop on high laying patches. Division of the field into small, suitably bunded, level plots should be encouraged everywhere.

In tracts of relatively low rainfall or where rain is received in sharp showers separated by long intervals of dry weather, dry farming practices including contour and compartment bunding should be introduced. Sowing of drought resistant varieties, application of bulky organic manure, use of a low seed rate, planting in widely spaced rows and frequent interculture are some of the other components of dry farming.

The protection of crops against insect pests and diseases produces bigger yields. This subject is treated separately in another paragraph.

The proper land use, depending on the nature of the soil and the prevailing climatic conditions will give the best production. No attempt should be made to grow crops not suited to a locality or soil. Culturable waste lands, and marginal lands on which the growing of food and cash crops is uneconomic, should be utilised for the growing of useful trees and better quality grasses. Similarly village grazing lands may be improved by rotational grazing and re-seeding with suitable fodder grasses and legumes. Growing of field crops, vegetables and fruits, fodders, grasses and trees should conform naturally to best land use.

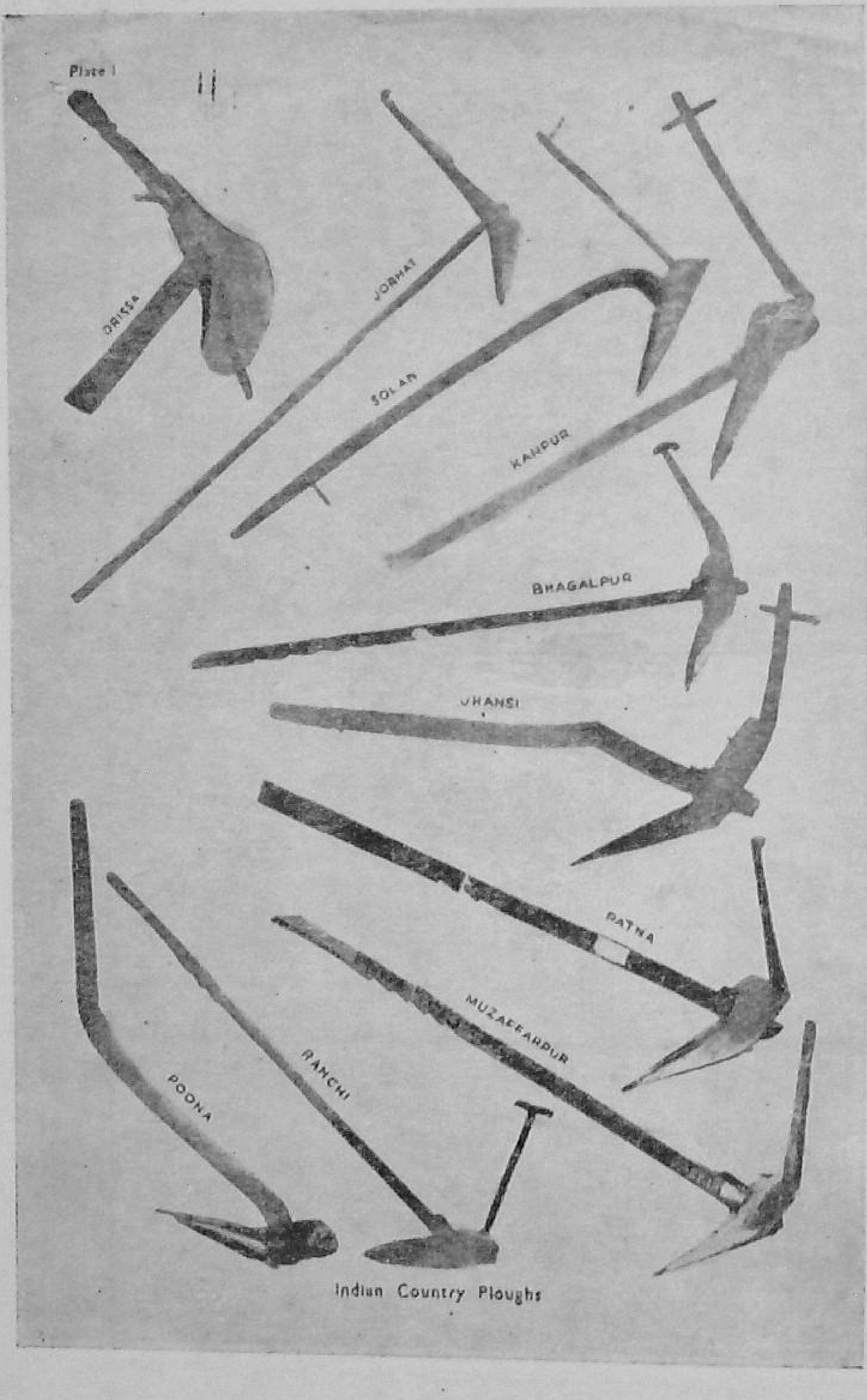
It will be observed from the above that improved technique should cover improved rotations, including the growing of leguminous crops ; mixed cropping ; better methods of preparing land, including tractor ploughing and summer cultivation ; sowing in lines with seed drills instead of sowing broadcast ; Japanese method of rice cultivation; double cropping ; inter-cropping and strip cropping ; dry farming practices including compartment bunding ; terrace cultivation and other methods of conserving soil moisture ; growing of fodder crops ; prevention of soil erosion, and a more efficient weed eradication. Use of improved furnaces for gur making and better methods of retting in the case of fibre crops should also be recommended wherever necessary.

5. **Use of improved implements**.—The farming implements in common use all over India are few and simple. The iron-shod wooden ploughs *bakhar* or blade harrow, a beam leveller or clod crusher, wooden seed drill, *Kolpa* or blade cultivator and a sickle constitute the average farmer's armoury of implements. In Punjab and some of the States in Northern India, spike harrows take the place of blade-harrows.

Essentially similar in design in all parts of the country, the wooden plough varies in dimensions to suit the prevailing soil and

Paddy crop grown by Japanese method (*Right*) compared with that grown in the ordinary way

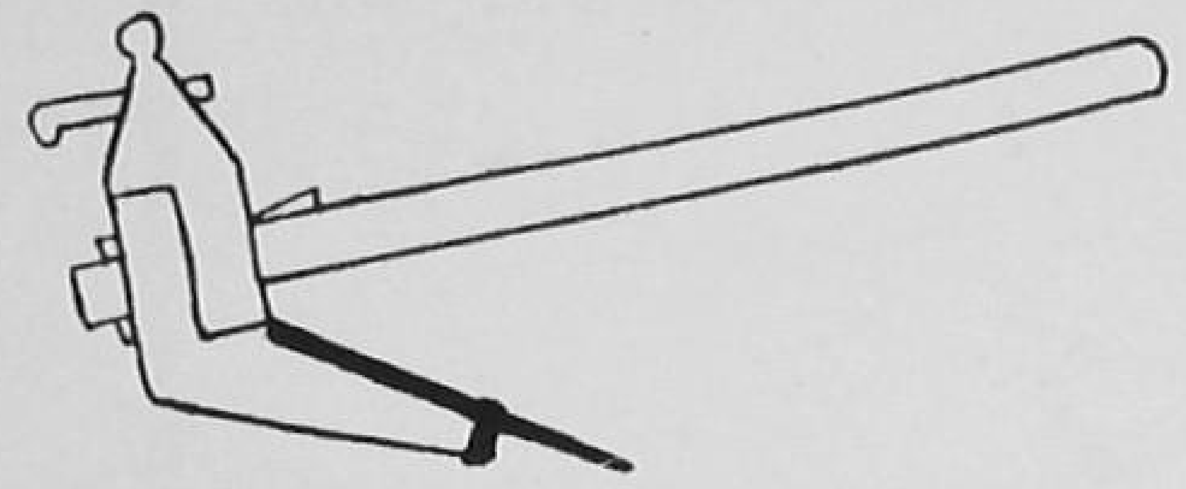
Paddy plants showing profuse tillering under Japanese method



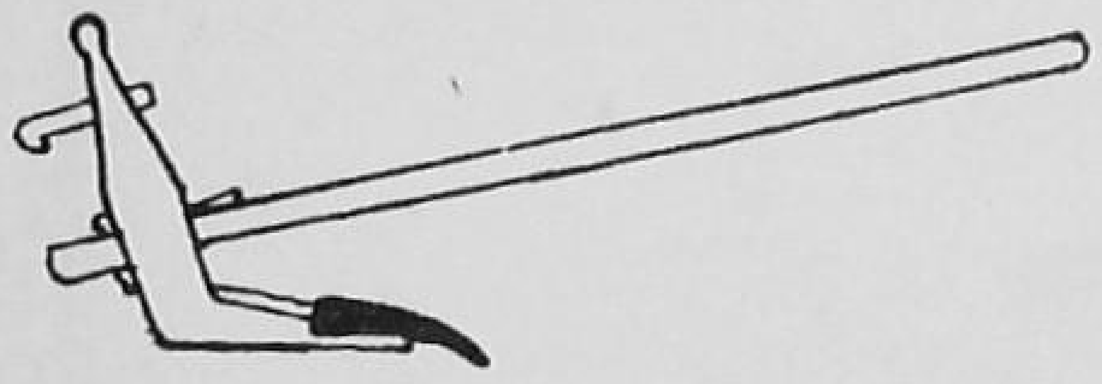
Indian Country Ploughs

Varieties of Indian ploughs

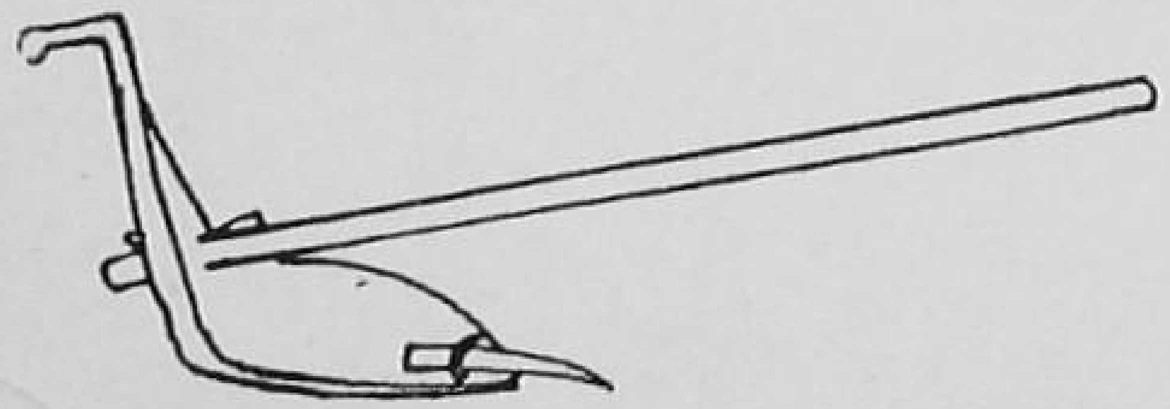
SURVEY OF INDIGENOUS AGRICULTURAL IMPLEMENTS OF INDIA



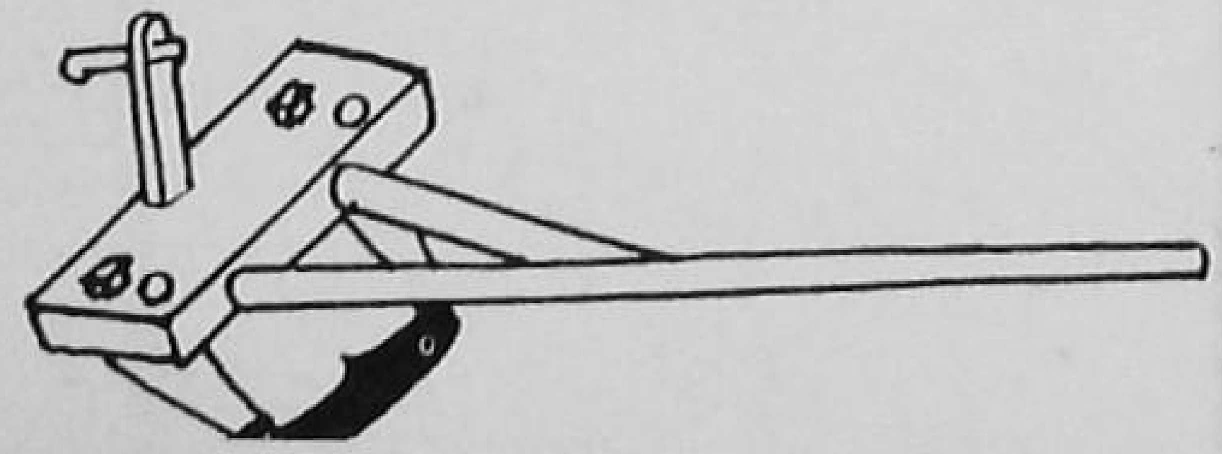
1 A HEAVY DECCEN PLOUGH



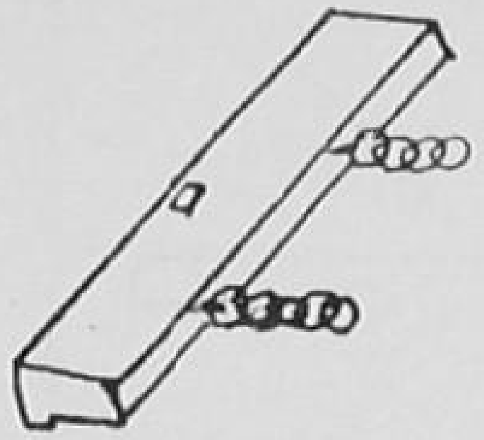
2 LIGHT U. P. PLOUGH



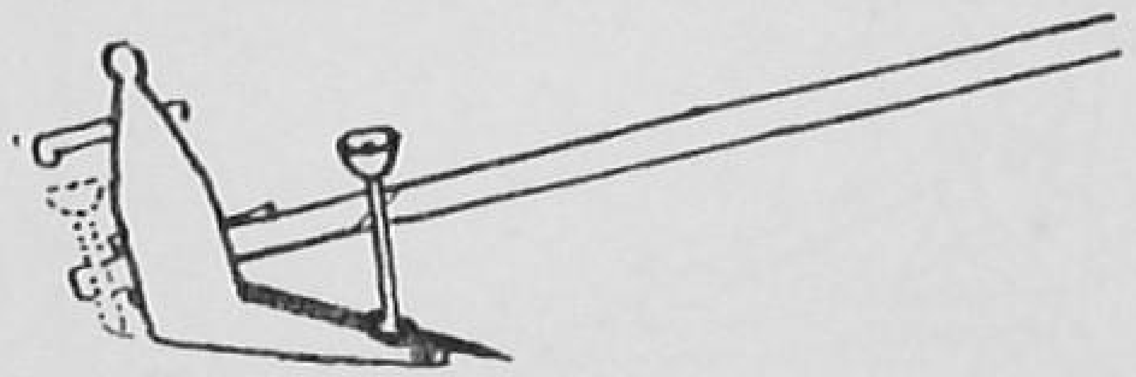
3 ORISSA PLOUGH FOR PUDDLING RICE FIELDS



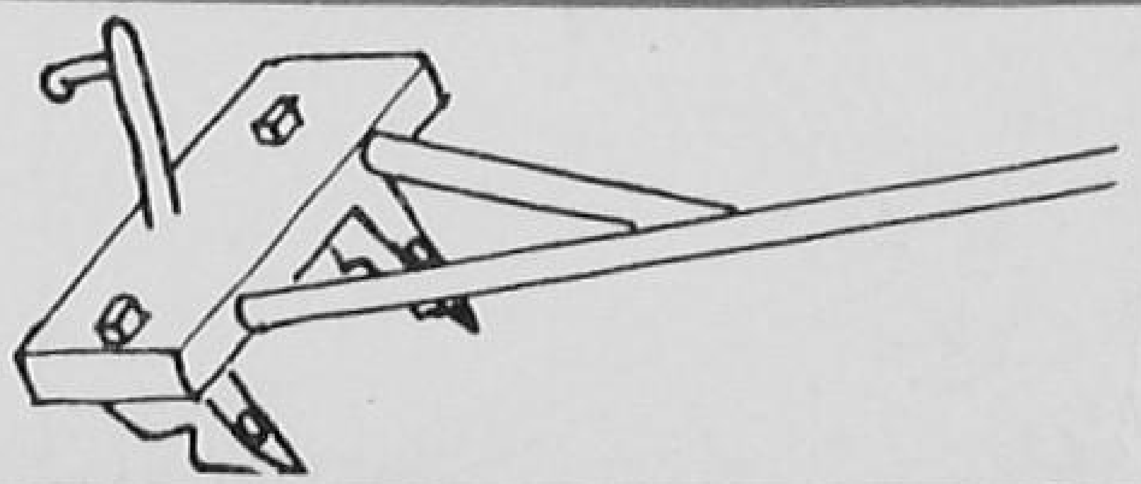
4 BAKHAR GUNTAKA OR BLADED HARROW



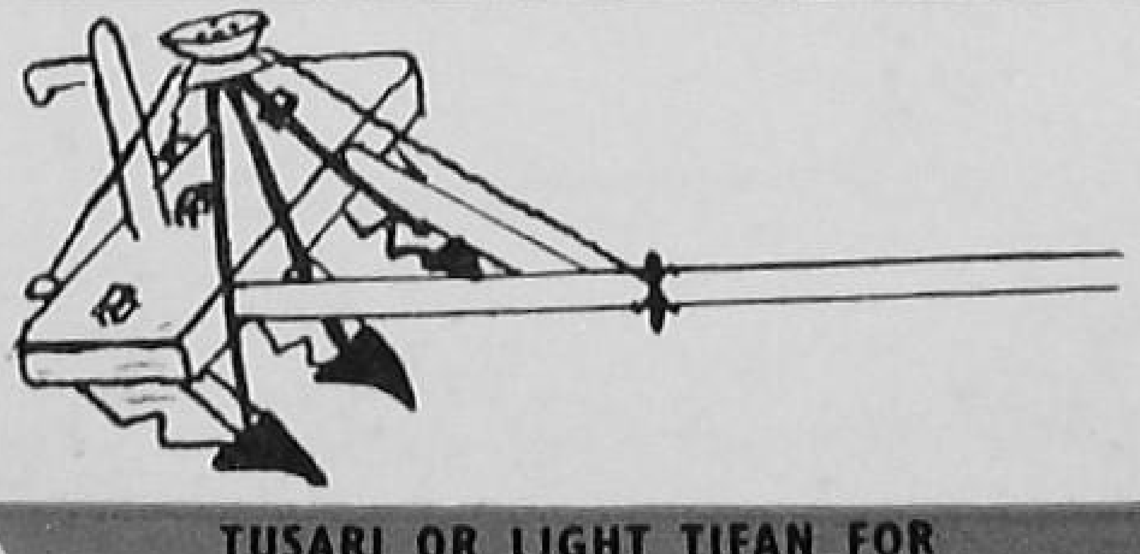
5 LEVELLING PLANK



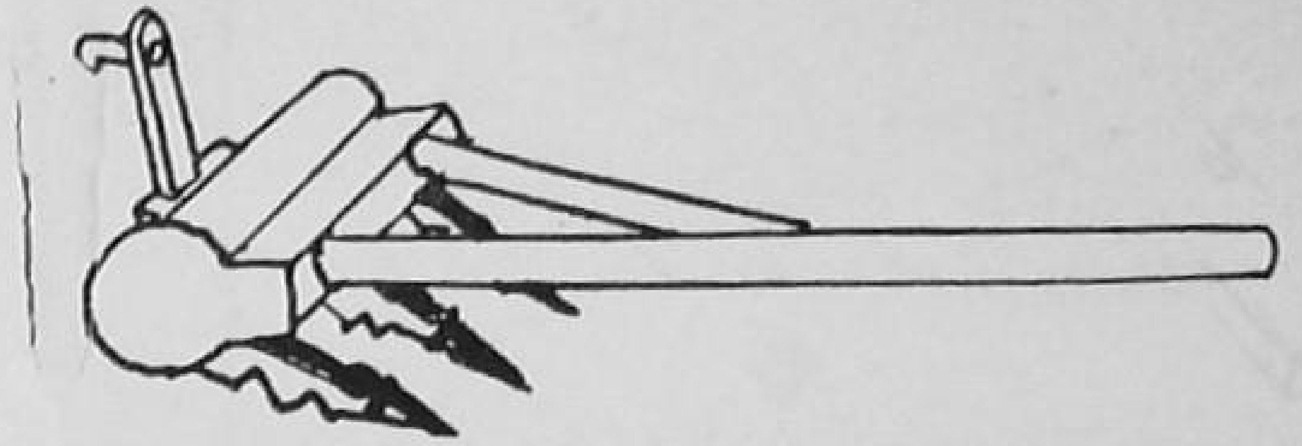
6 NARI - HAL (PLOUGH) OF NORTH M. P.



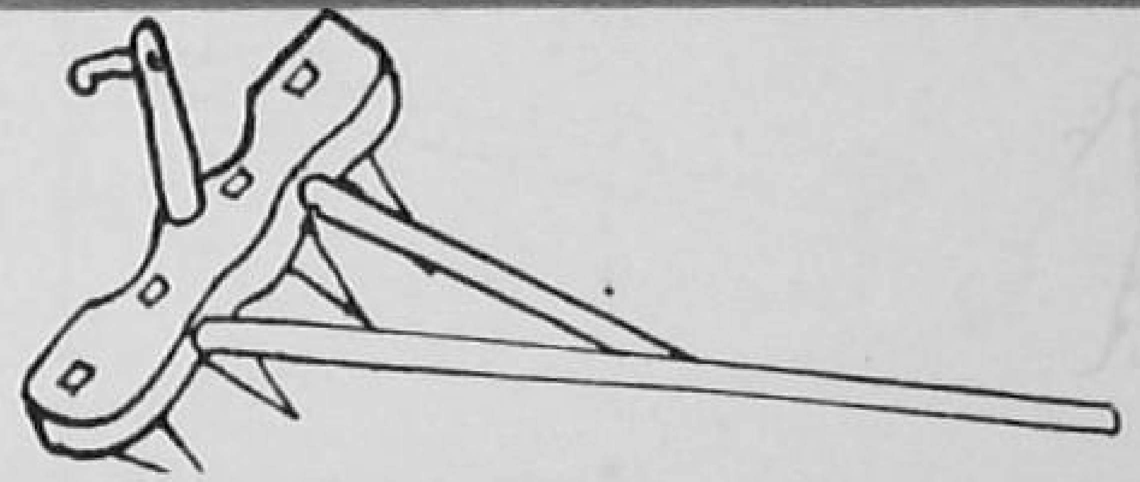
7 DUFAN OR A TWO TYNED SEED DRILL



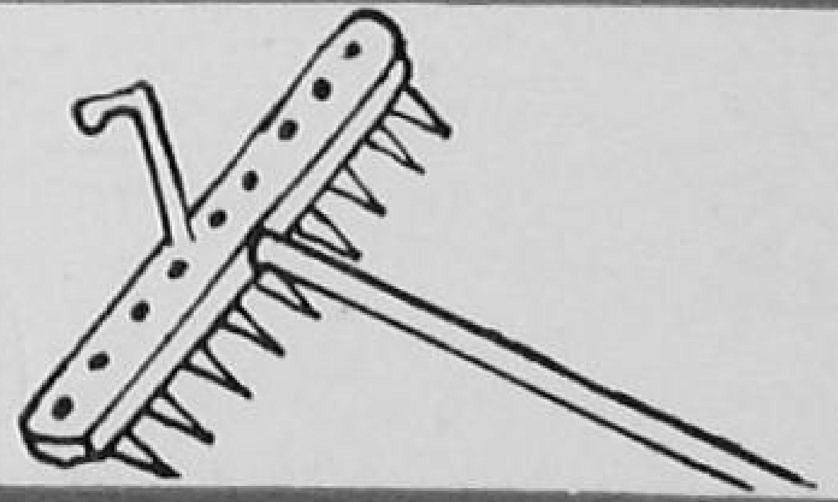
8 TUSARI OR LIGHT TIFAN FOR SOWING KHARIF CROPS



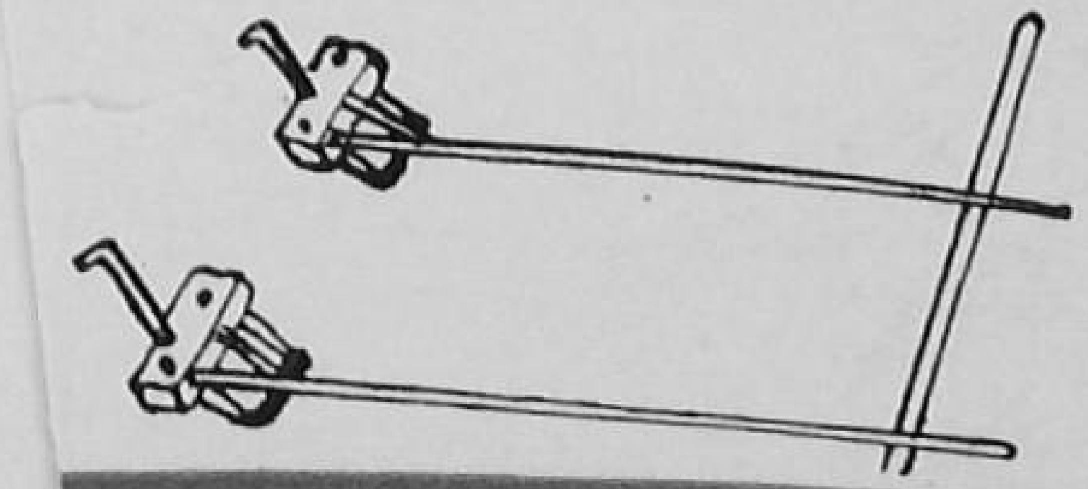
9 KATHANI OR HEAVY TIFAN FOR SOWING RABI CROPS



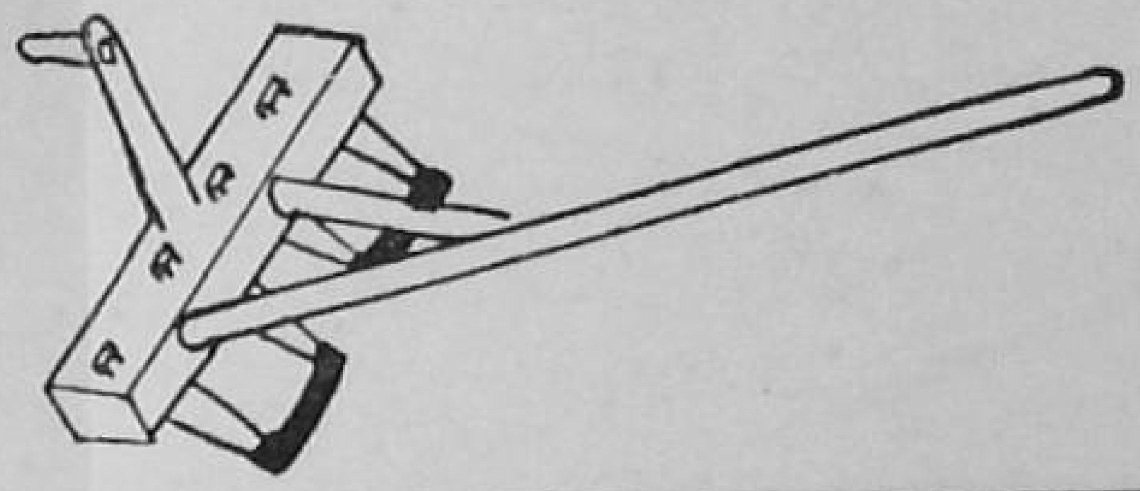
10 ARGADA FOR SOWING GROUND - NUT ETC. (may be four, five or six tyned)



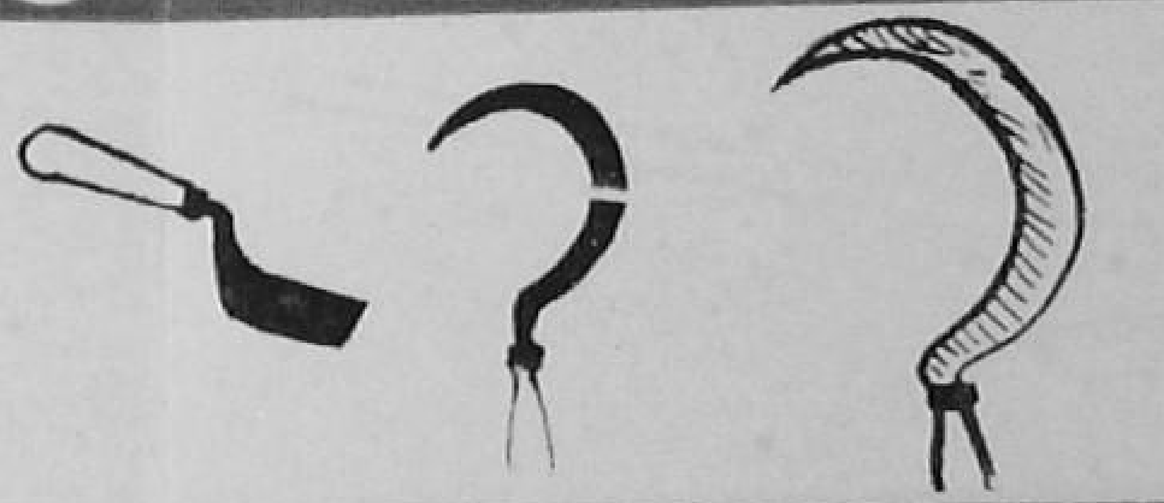
1 TARI OR TOOTH HARROW FOR PADDY FIELDS



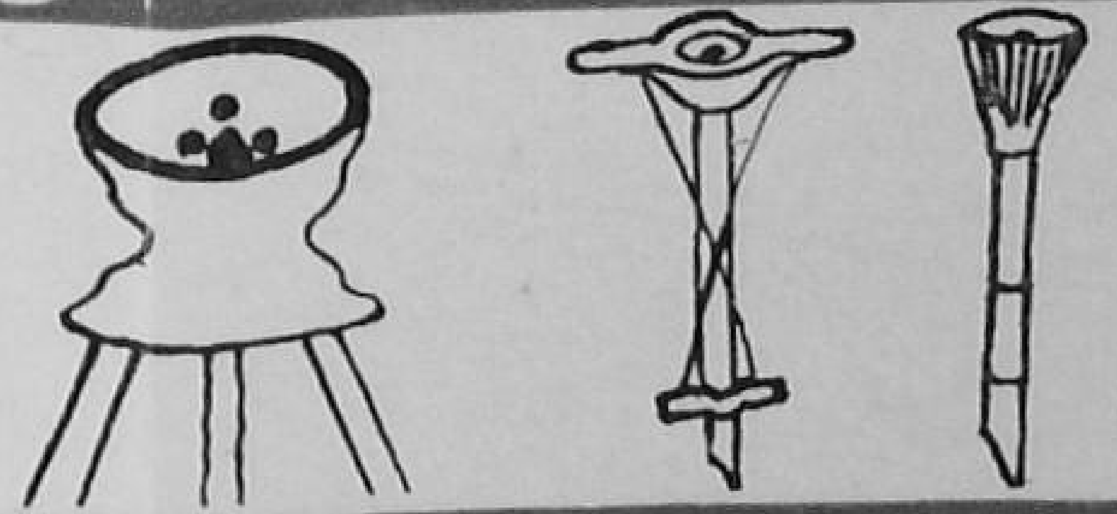
PAIR OF DOURAS OR HOES FOR INTER-
IVATION BETWEEN THE ROWS OF PLANTS



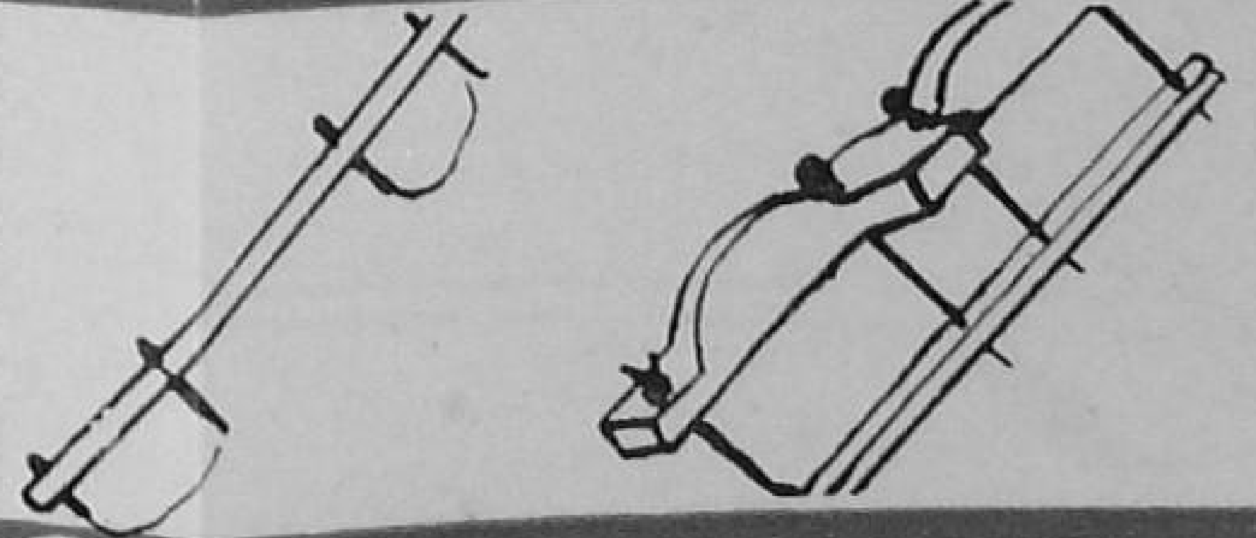
13 A DULARI OR TWIN DOURAS



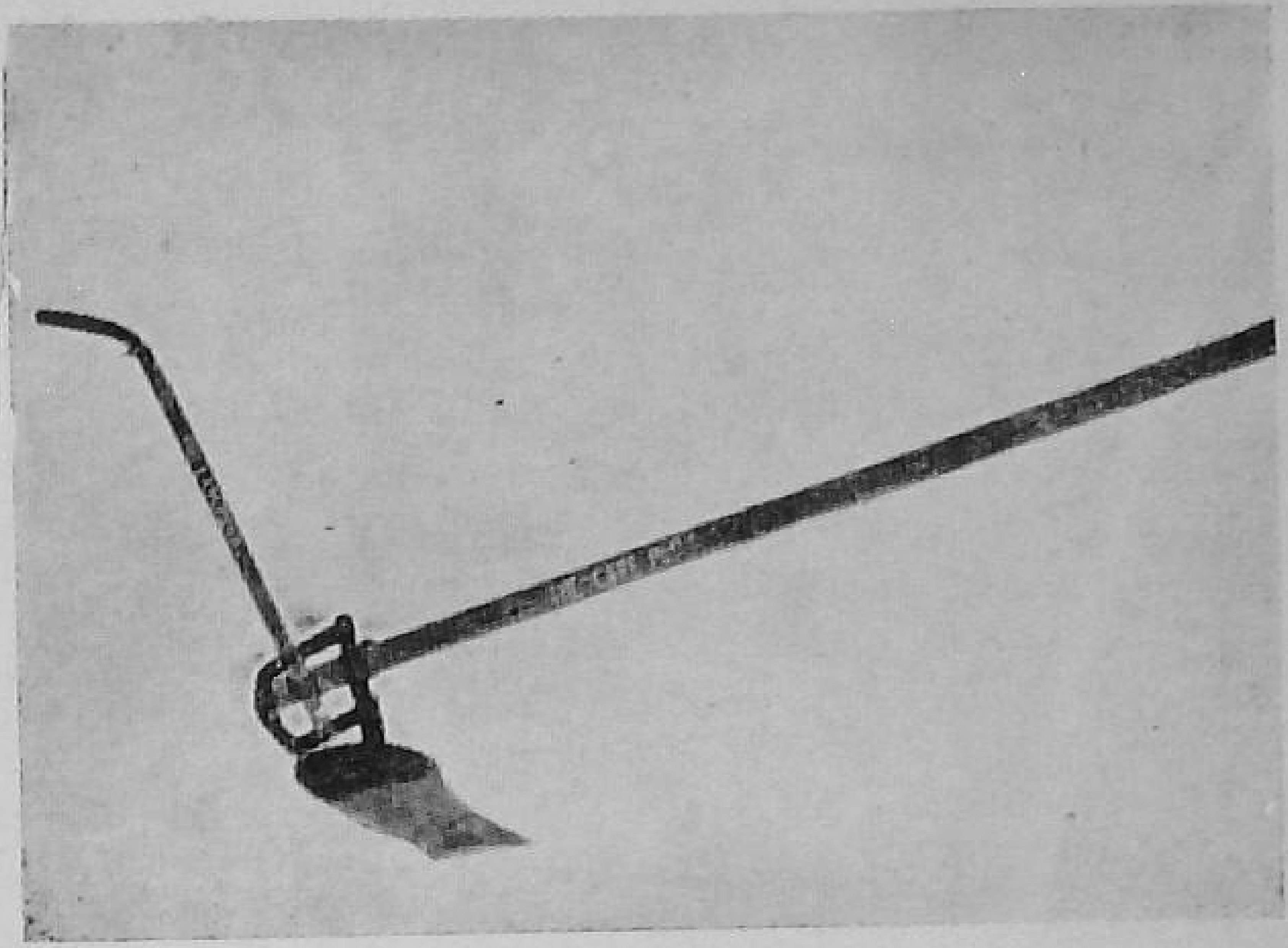
14 KHURPI AND SICKLES



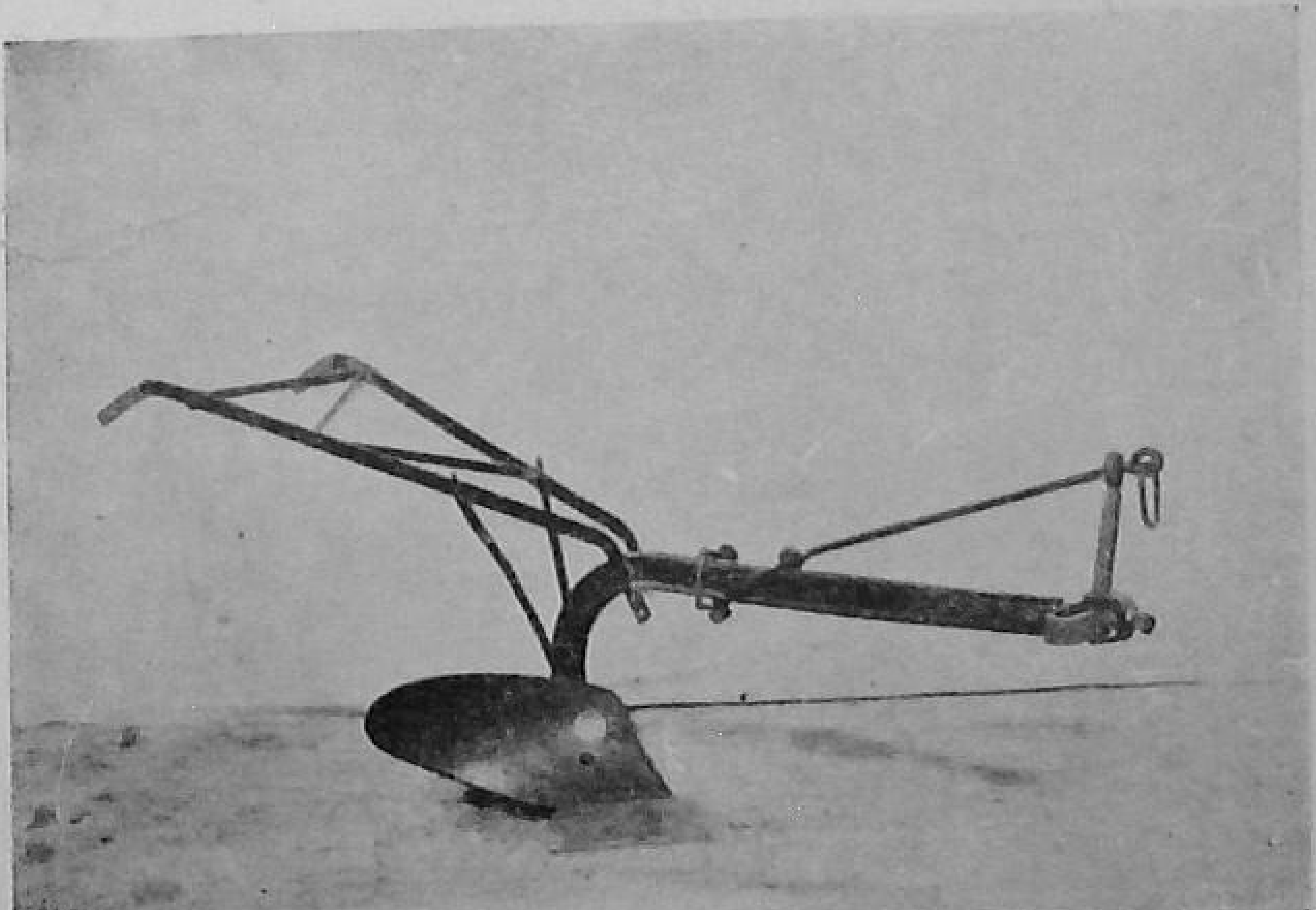
15 CHADA FOR TIFAN AND SARTAS OR TUBES FOR ARGADAS



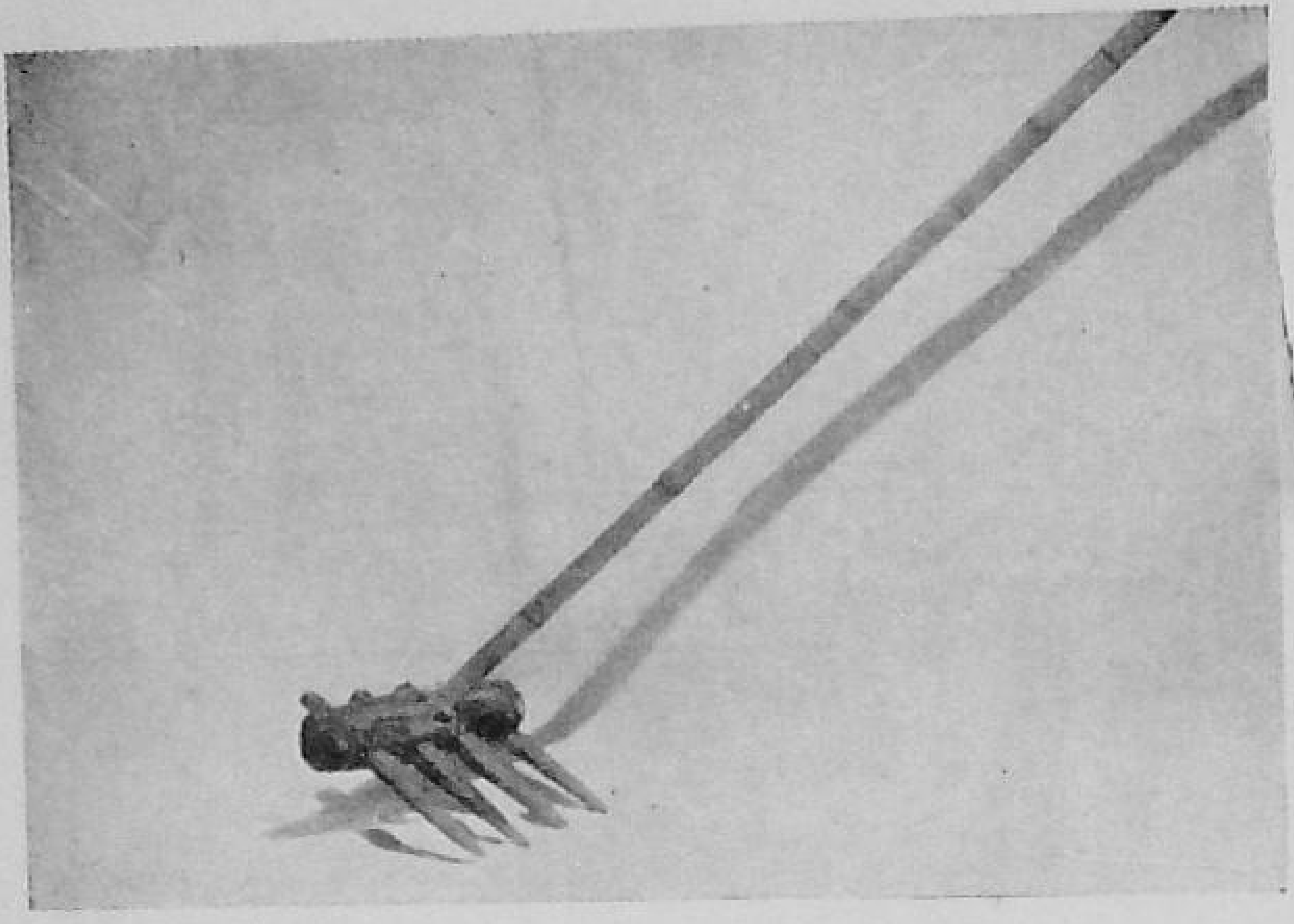
16 A LONG YOKE FOR A PAIR OF DOURAS



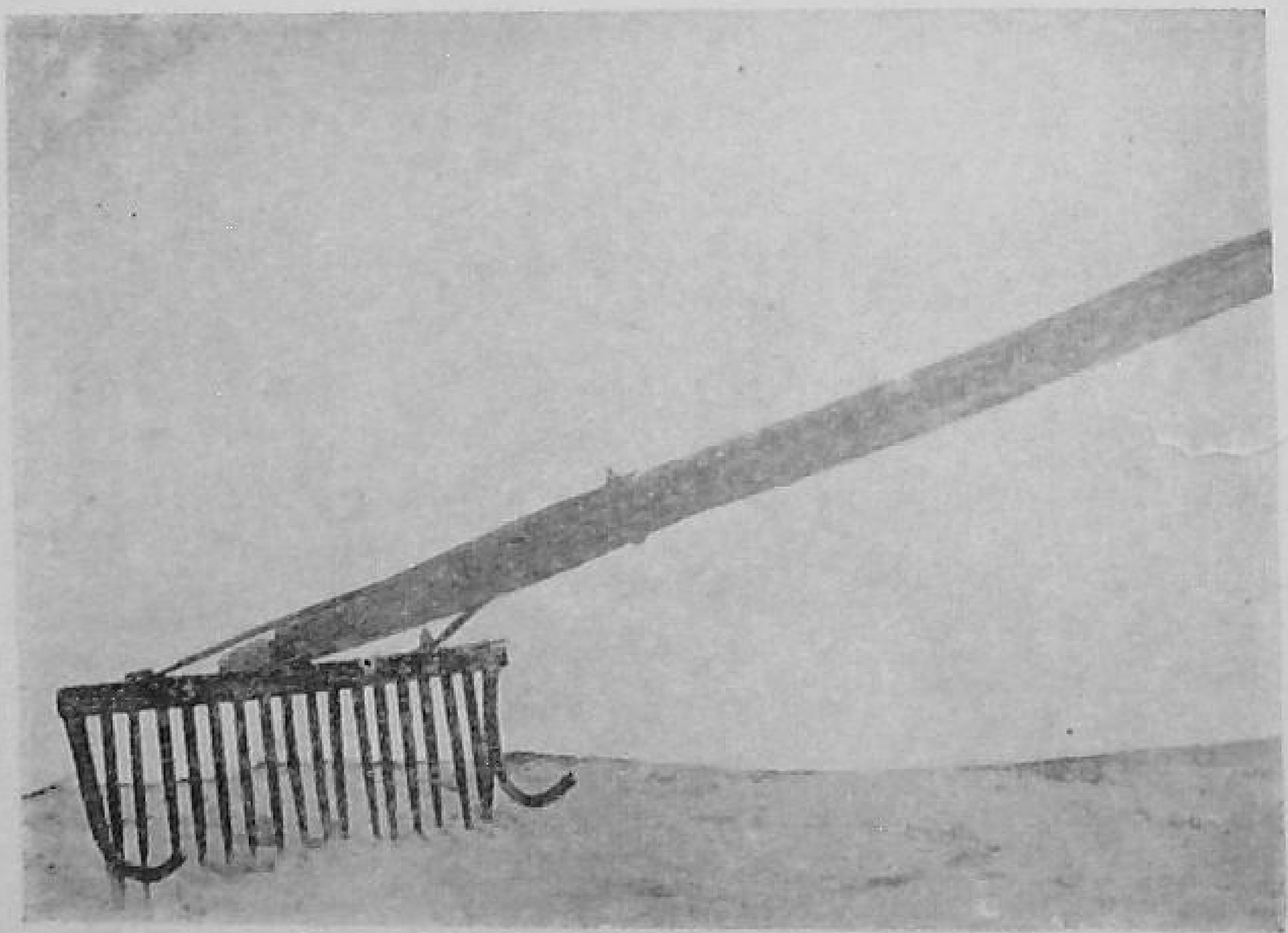
A light, soil-inverti ngiron plough



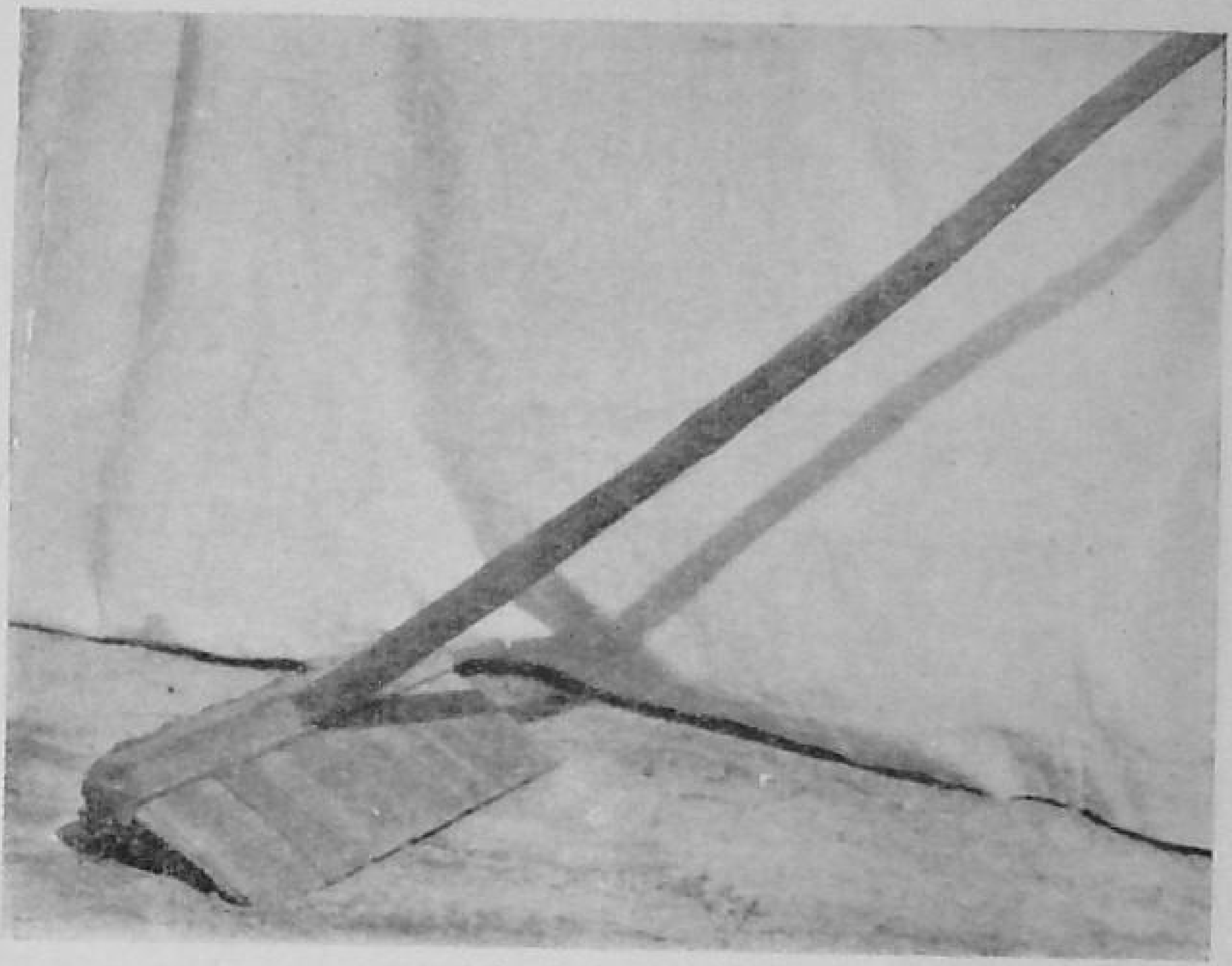
"Victory" mould board plough



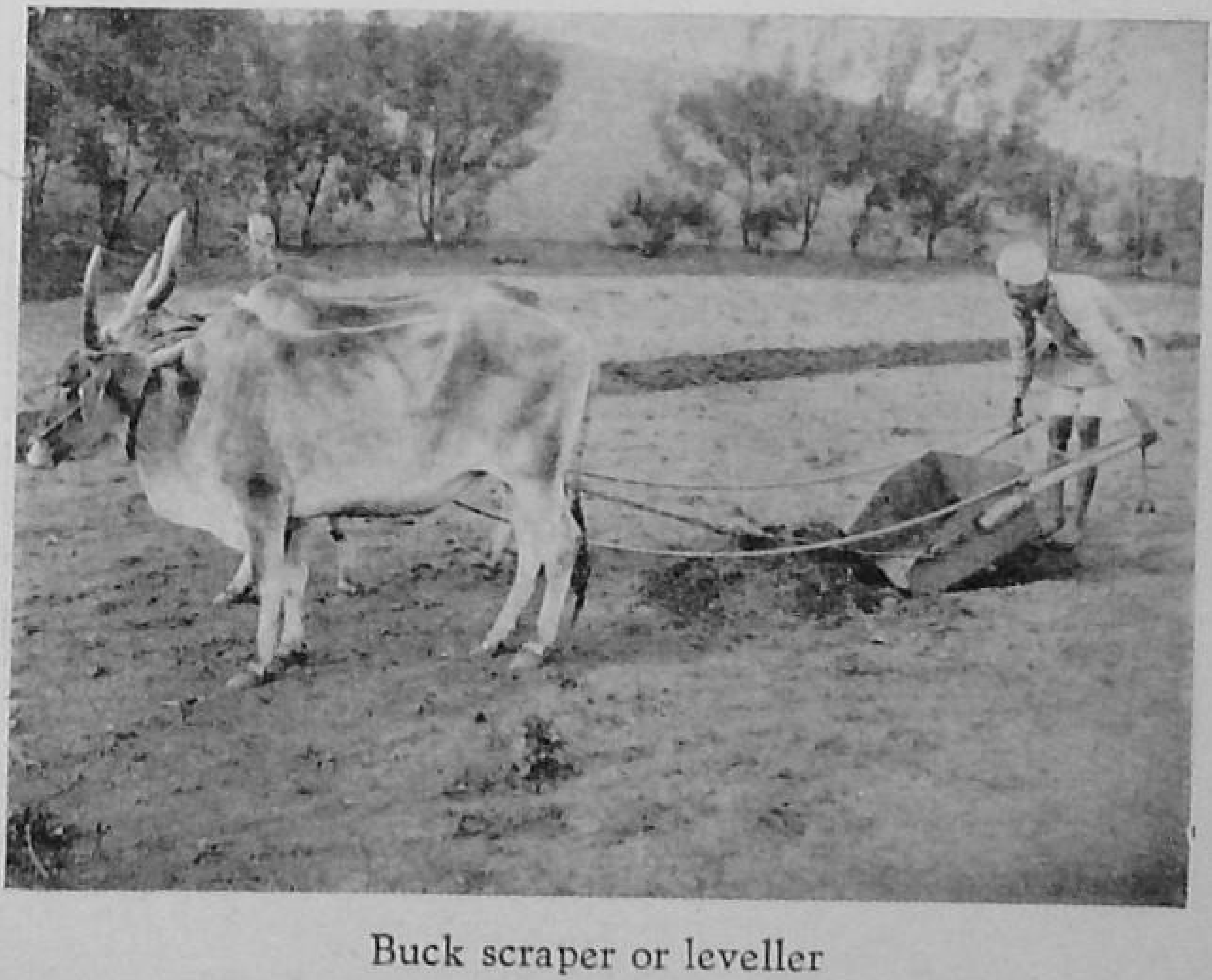
Hand rake for collecting trash



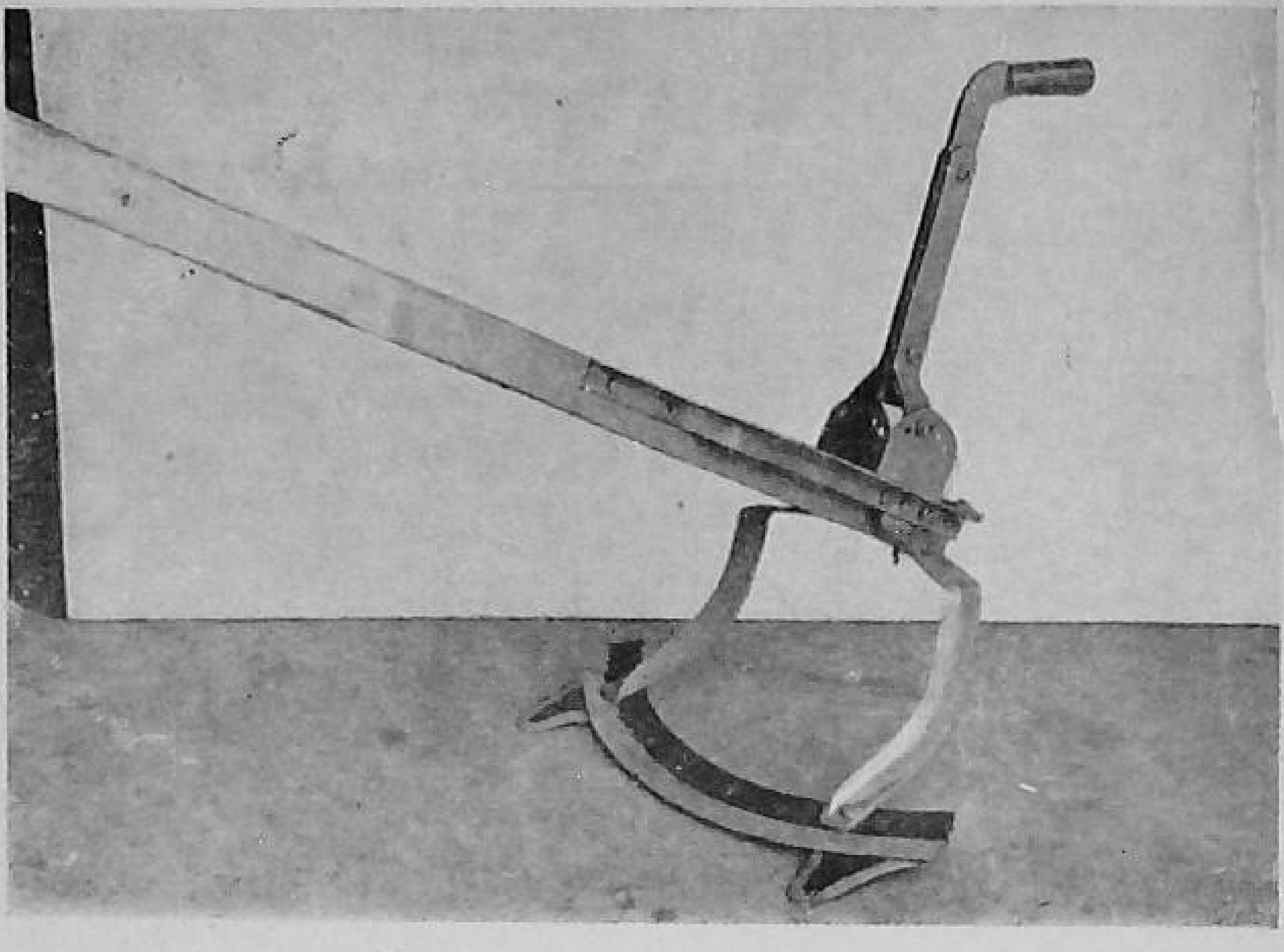
Eullock drawn rake for collecting stubbles



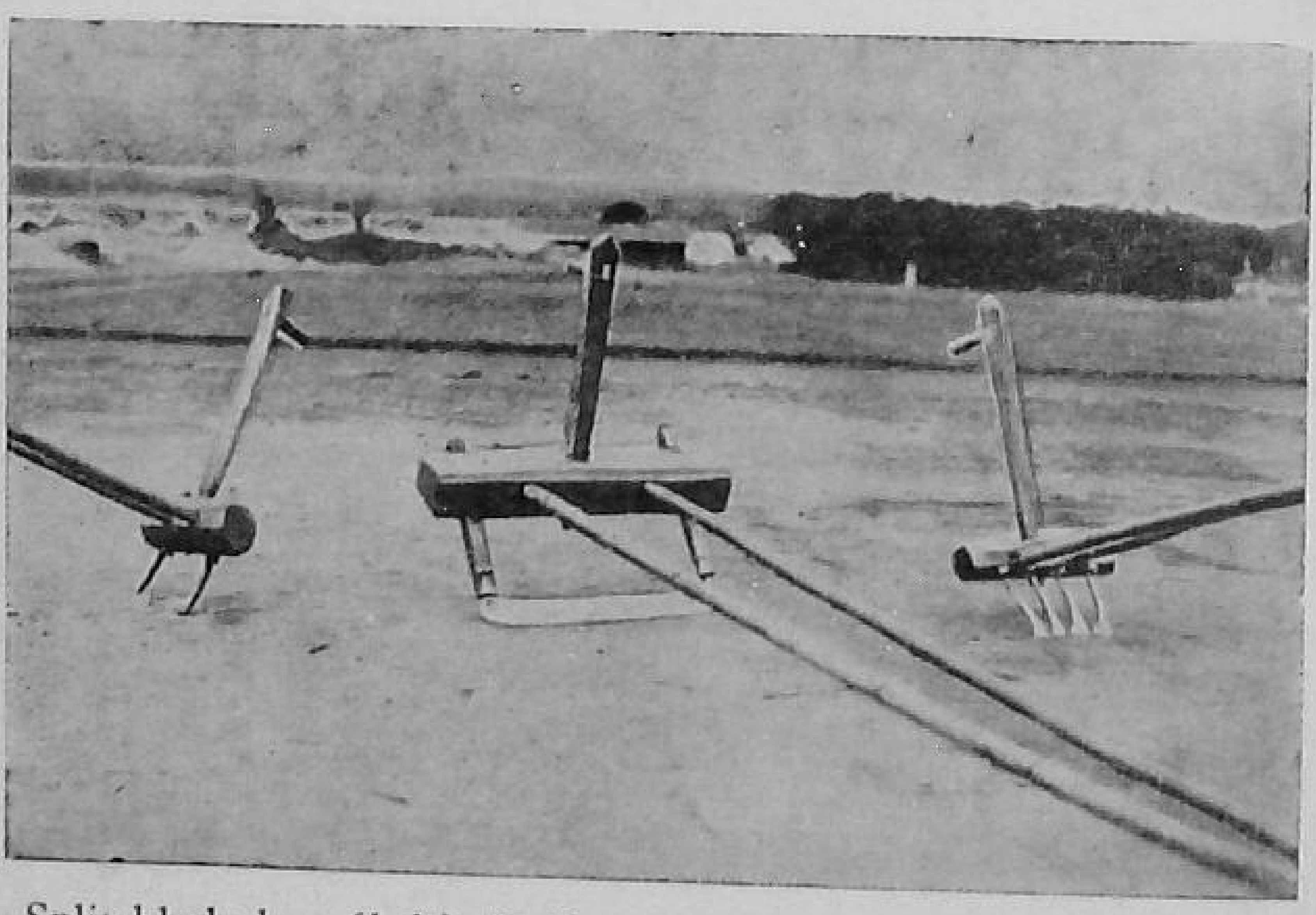
Levelling plank



Buck scraper or leveller

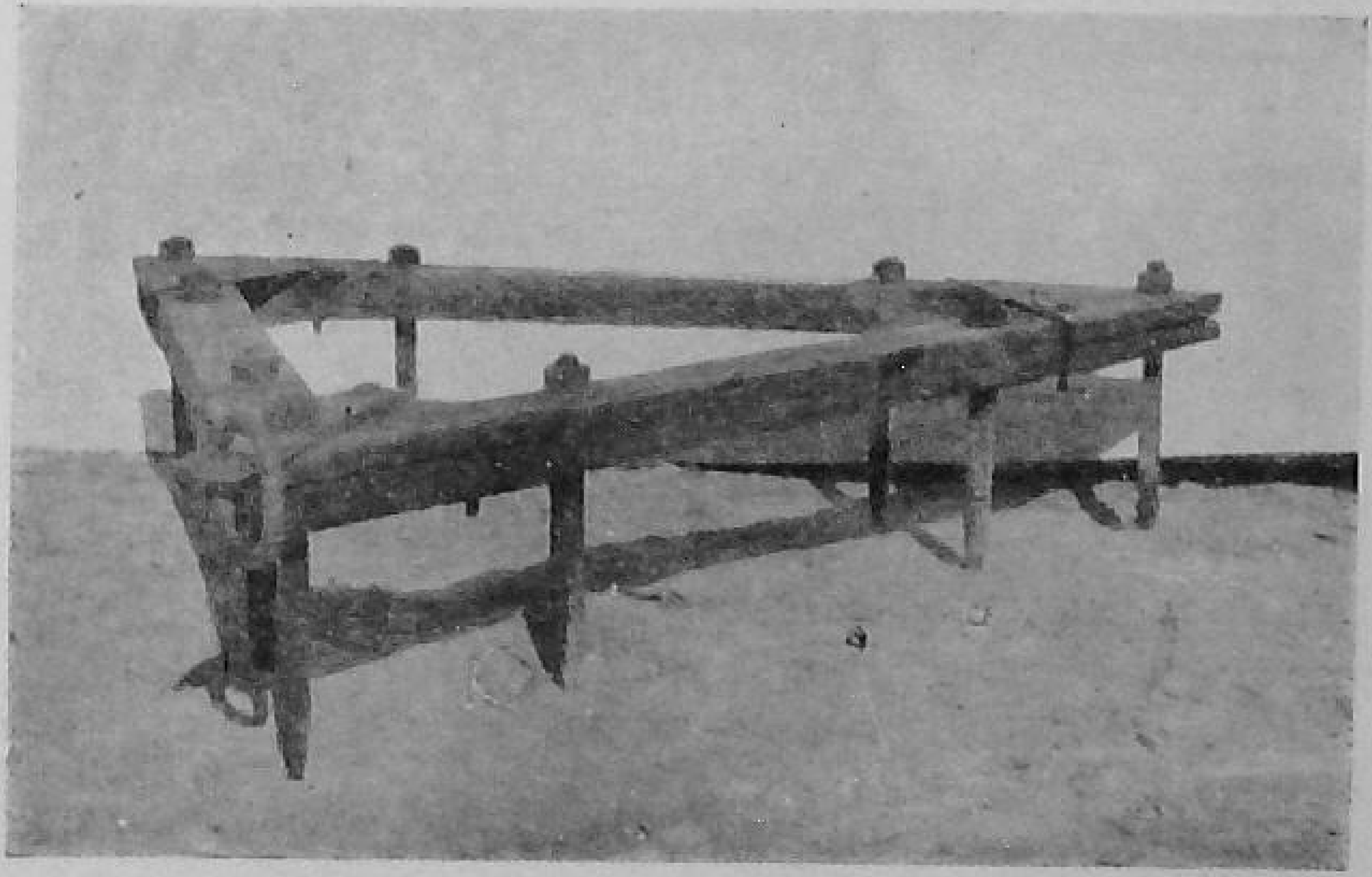


Gunataka used in Madras

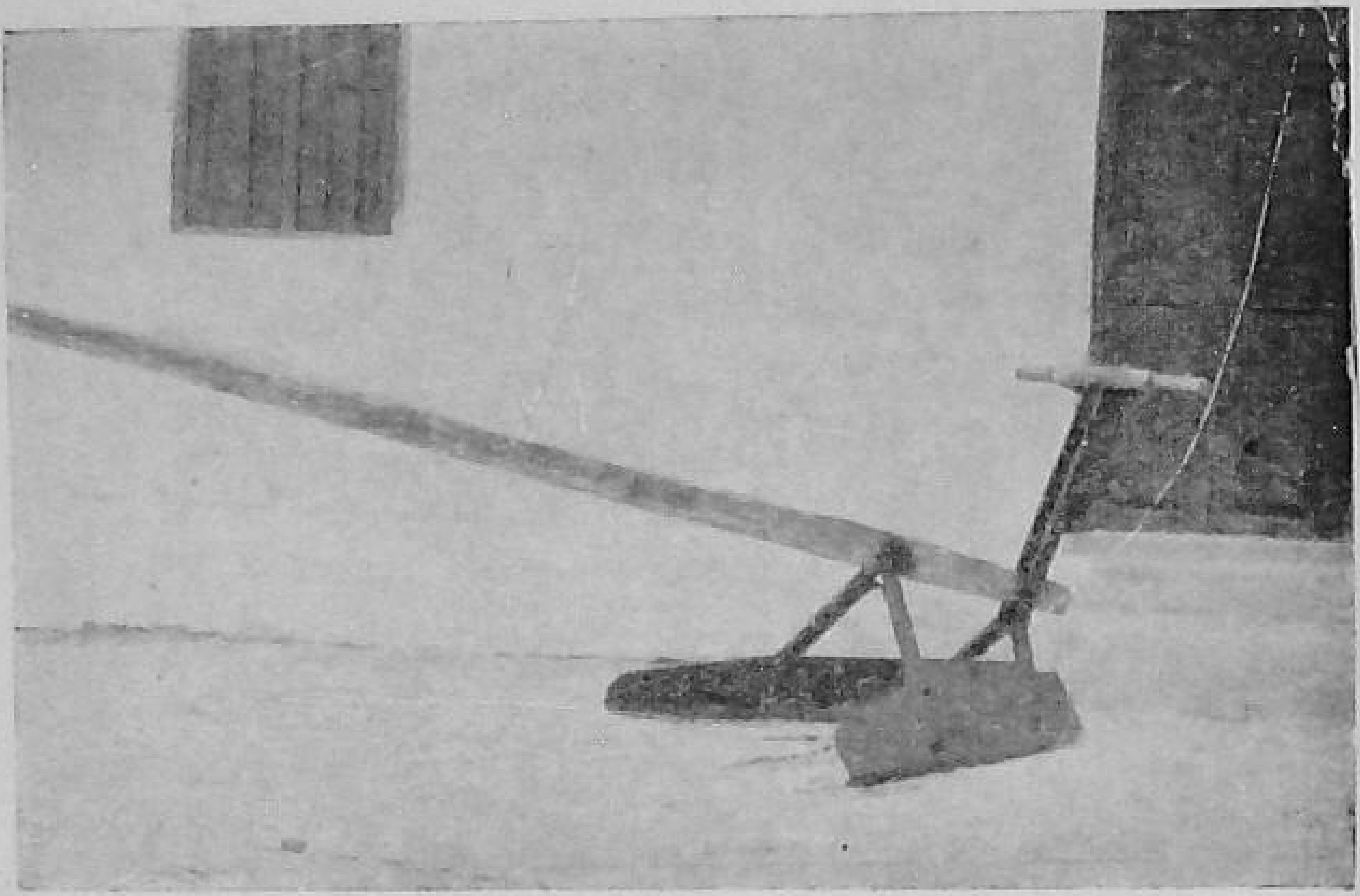


Split blade hoe (*left*), *Bakhar* or blade harrow (*centre*) and tooth-hoe (*right*) in common use in black soils in Central India & Deccan

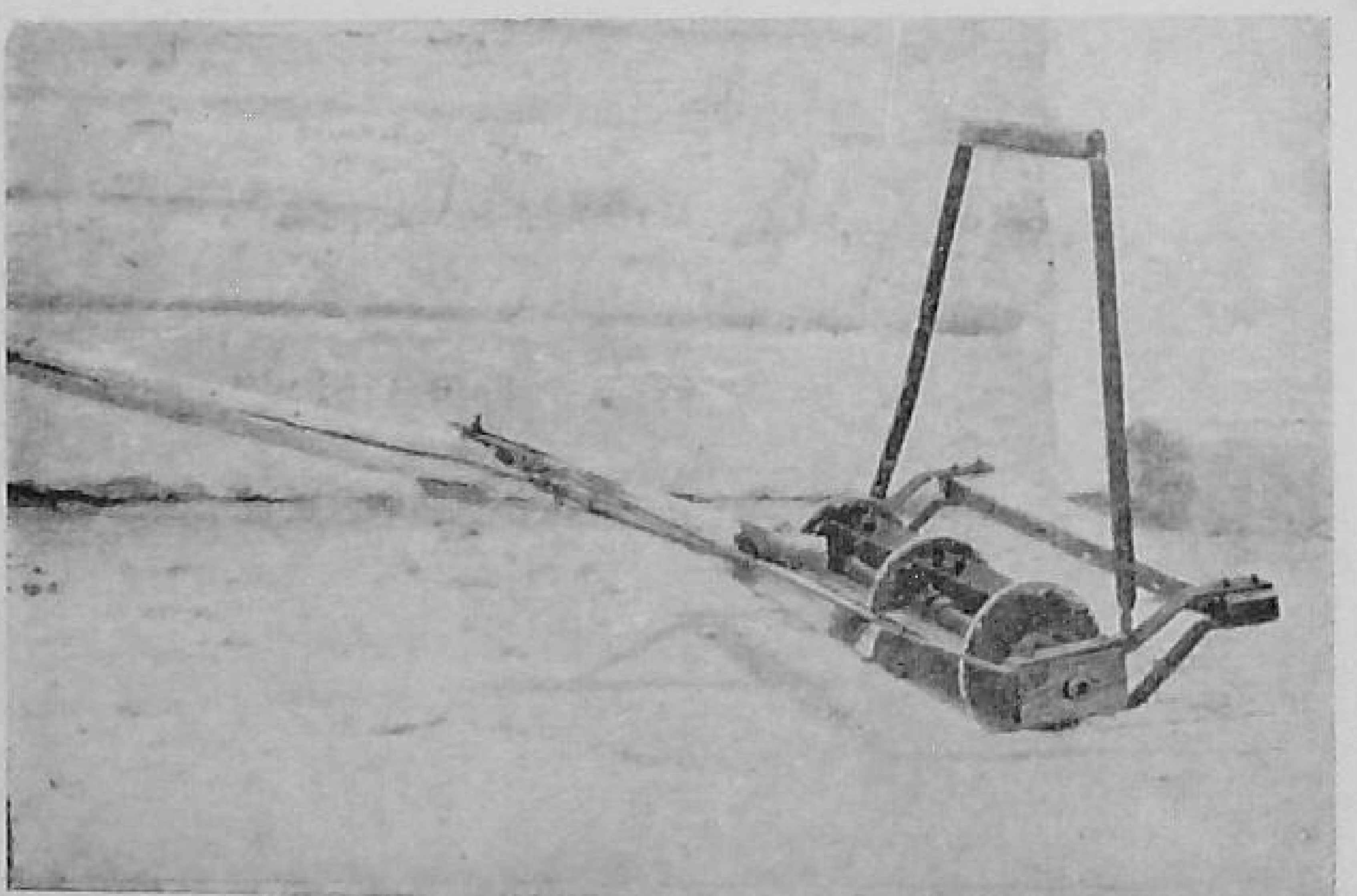
Pegged harrow



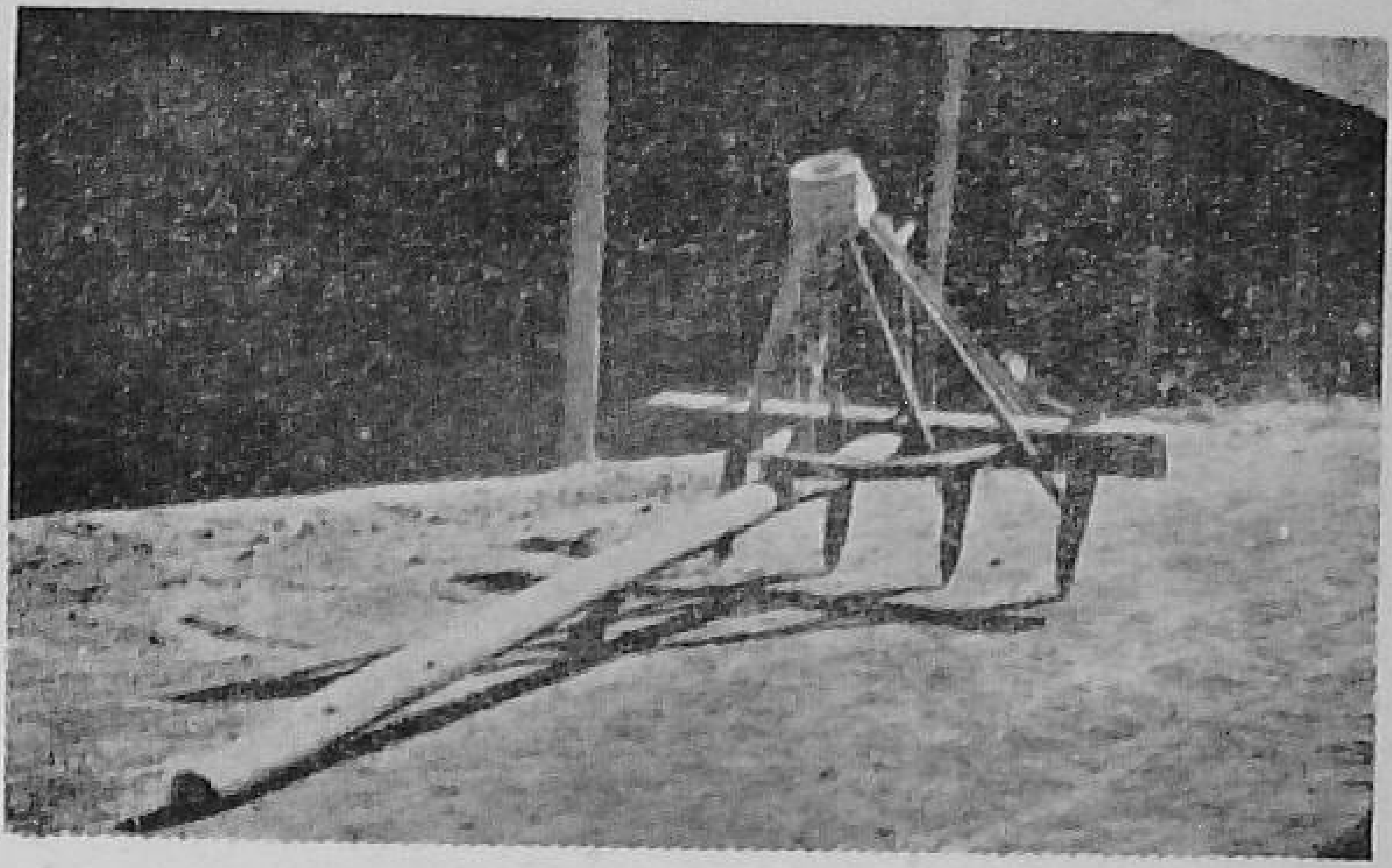
Triangular spike tooth harrow



Bund farmer

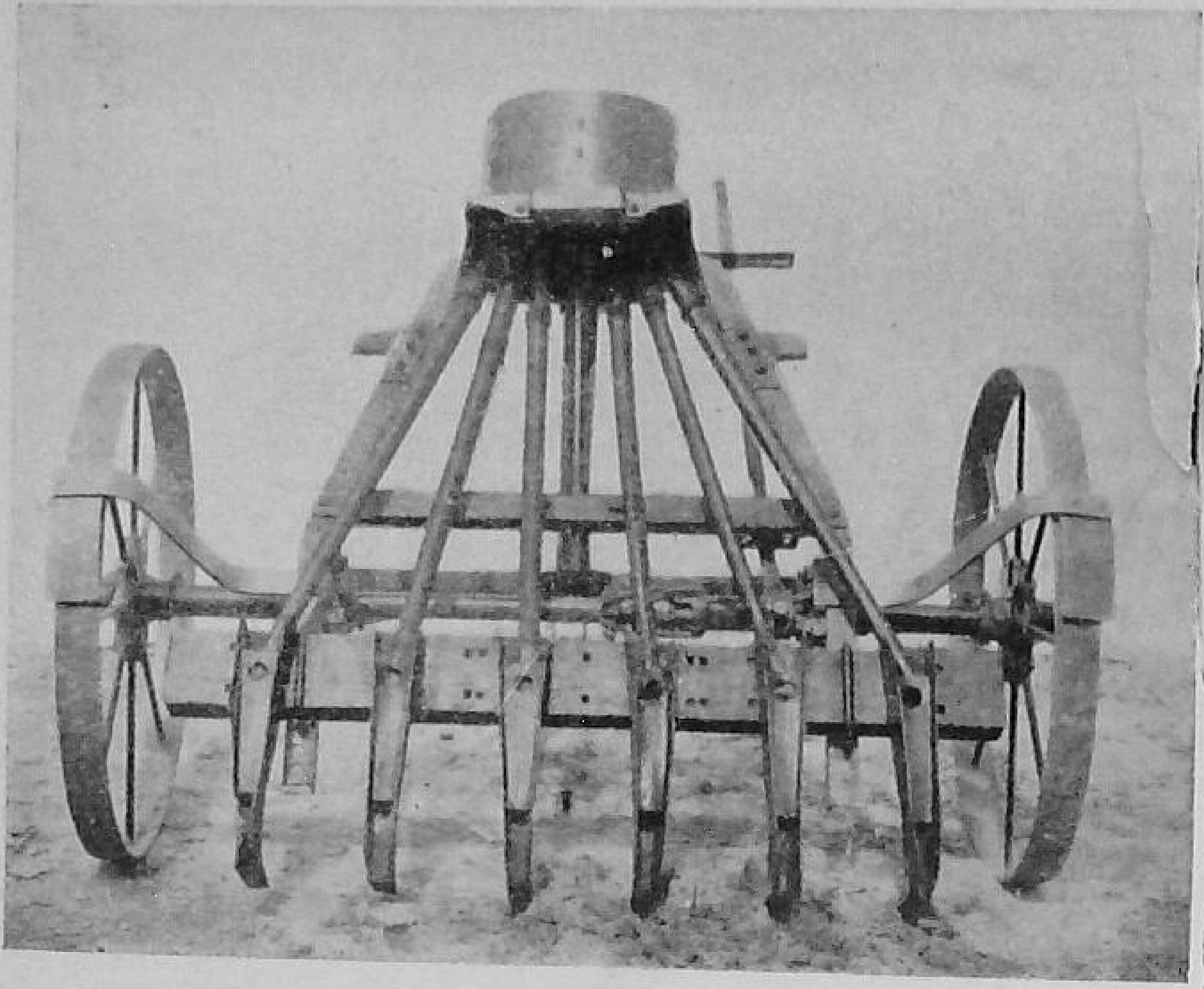


Green manure trampler for paddy fields

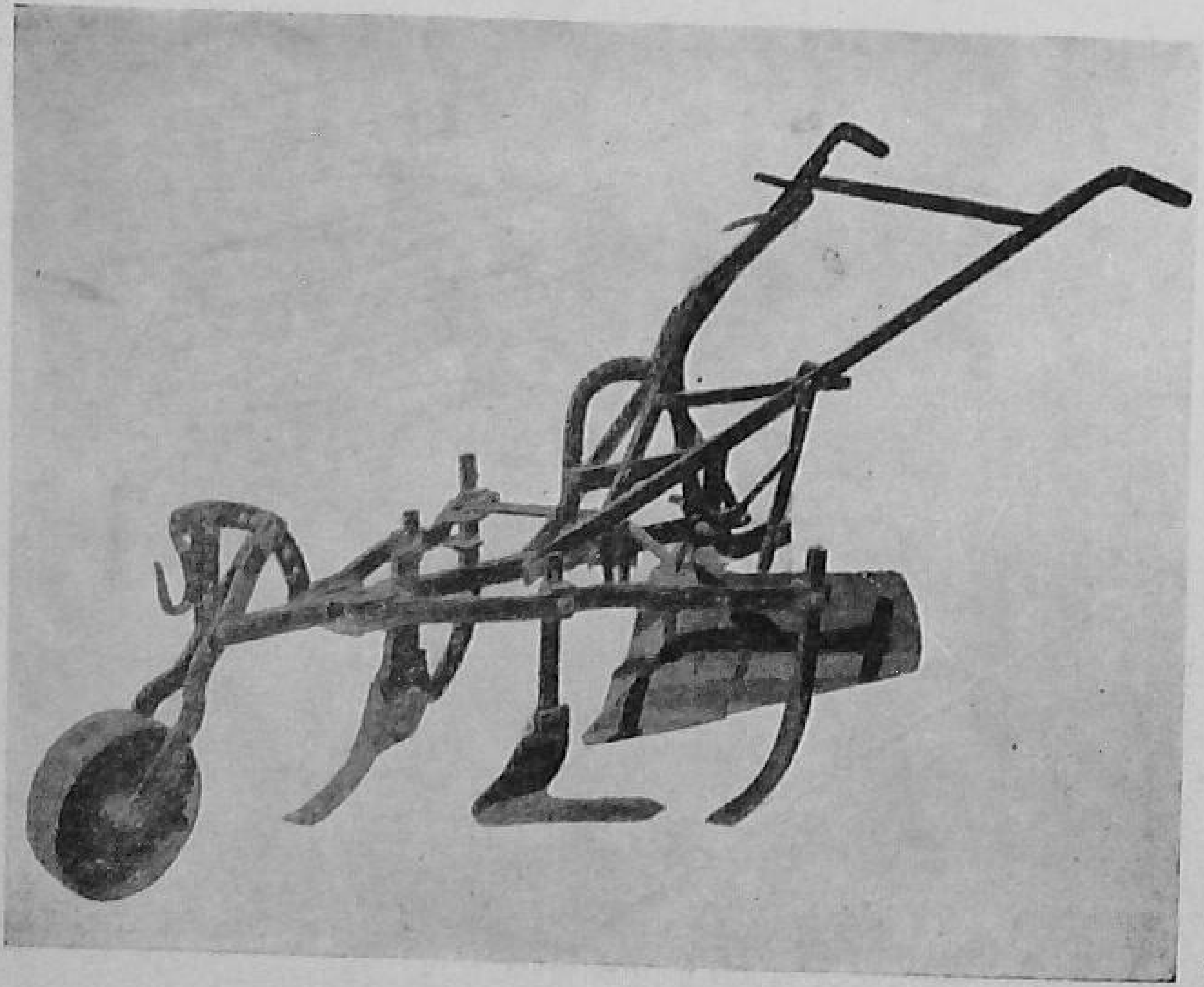


4 tyned wooden seed-drill

'Shabash' cultivator with seed-drill attachment

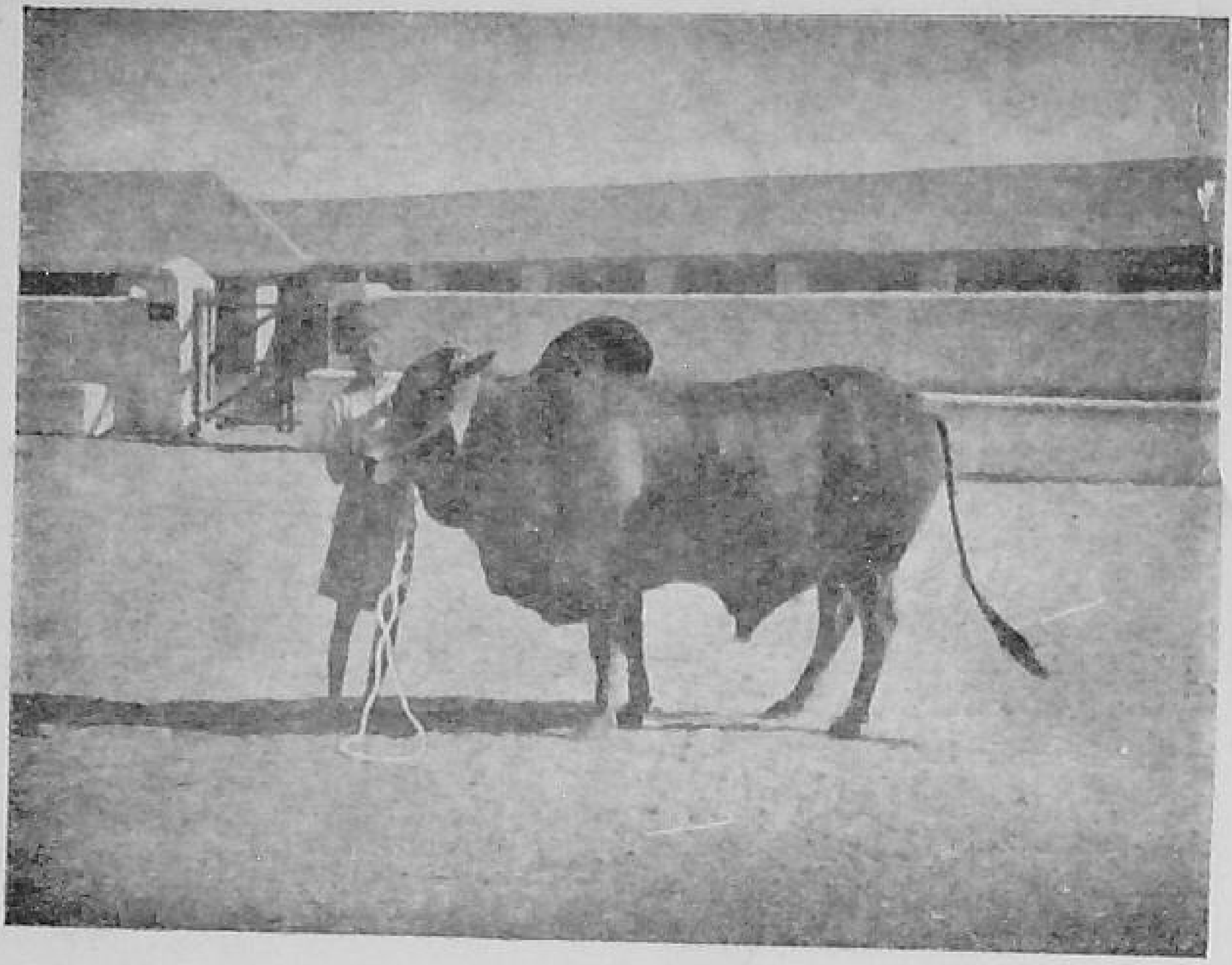


Mechanical seed-drill (rear view)

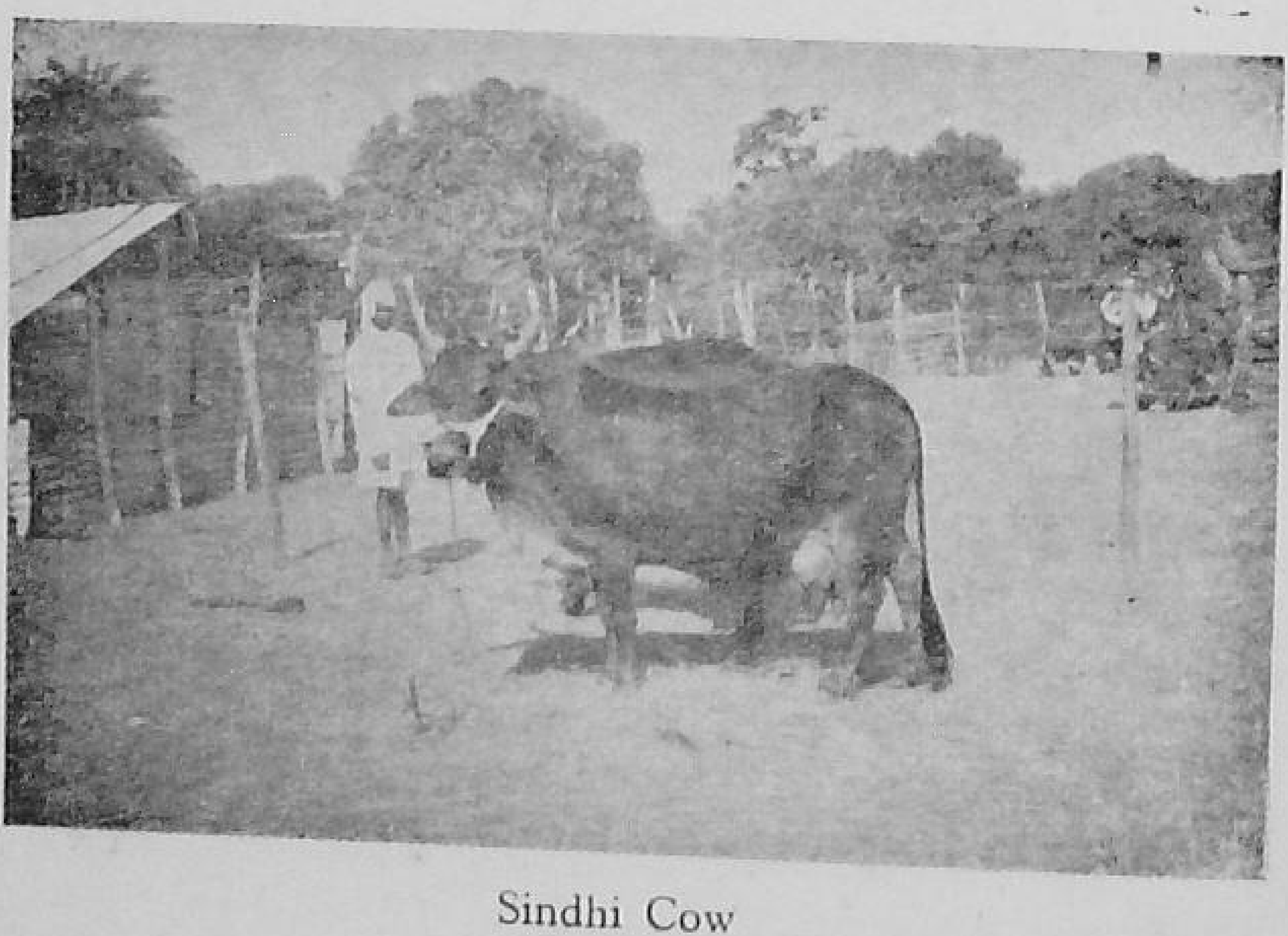


Cultivator with ridging attachmen:

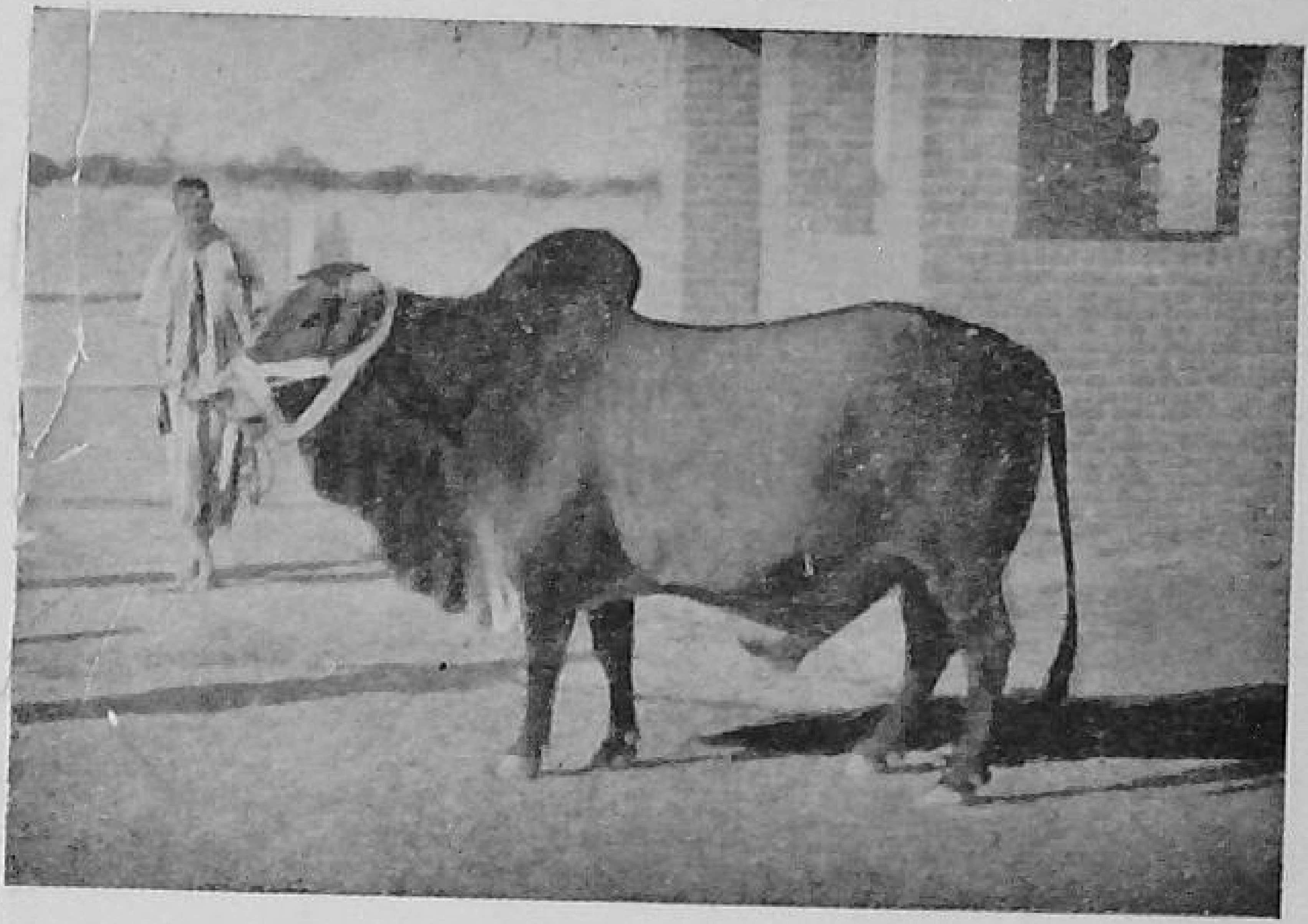
Japanese Rice Weeder



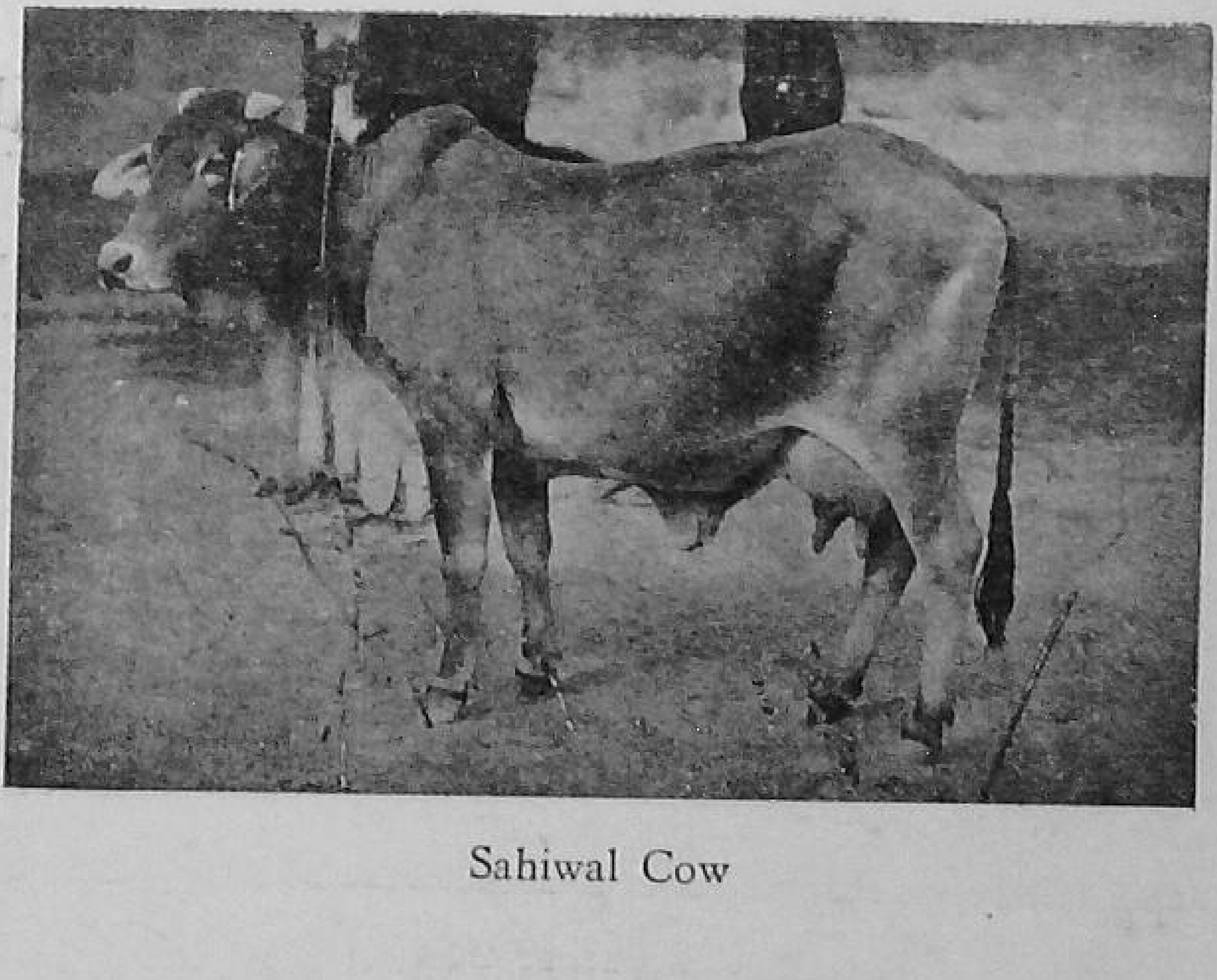
Sindhi Bull



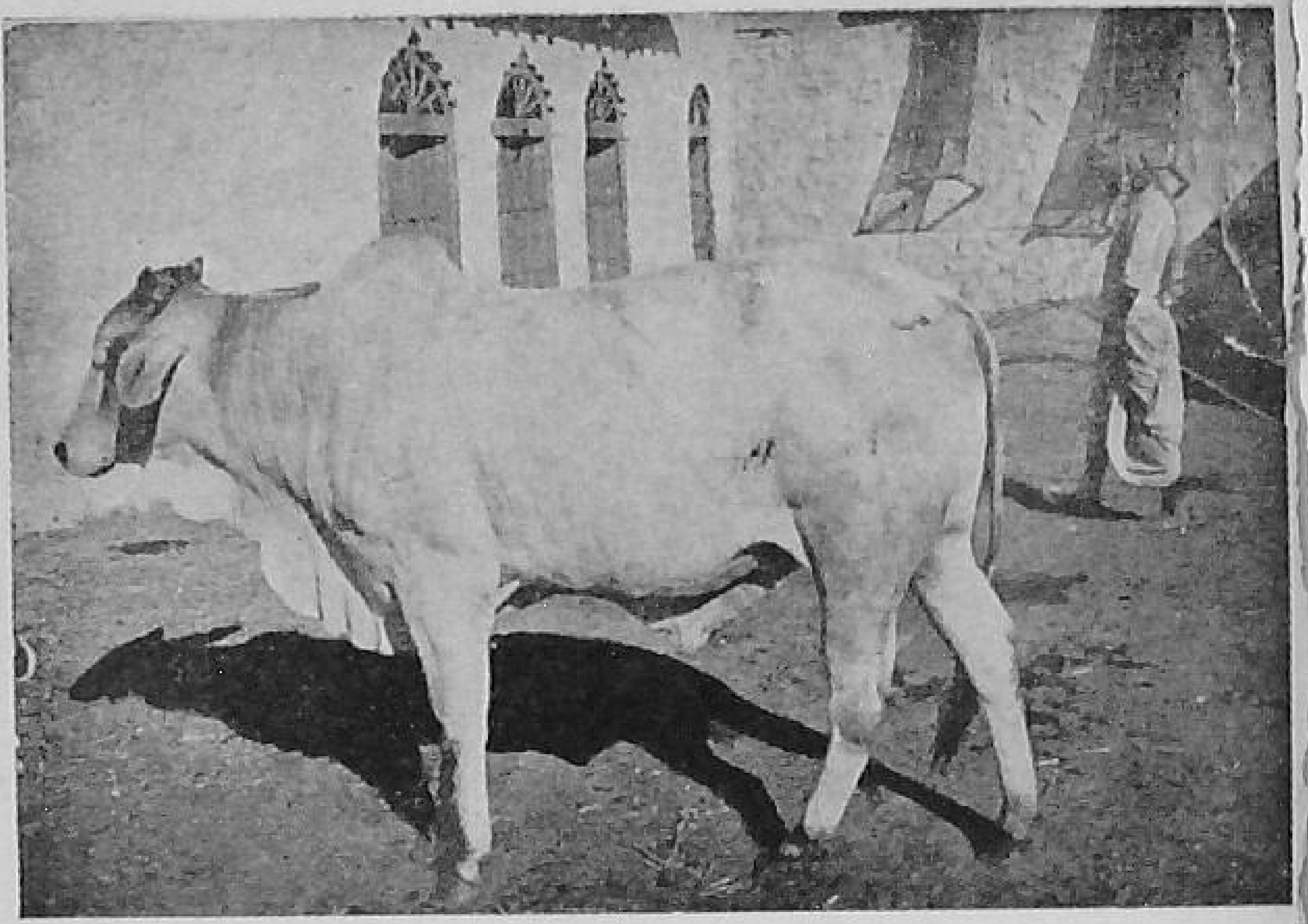
Sindhi Cow



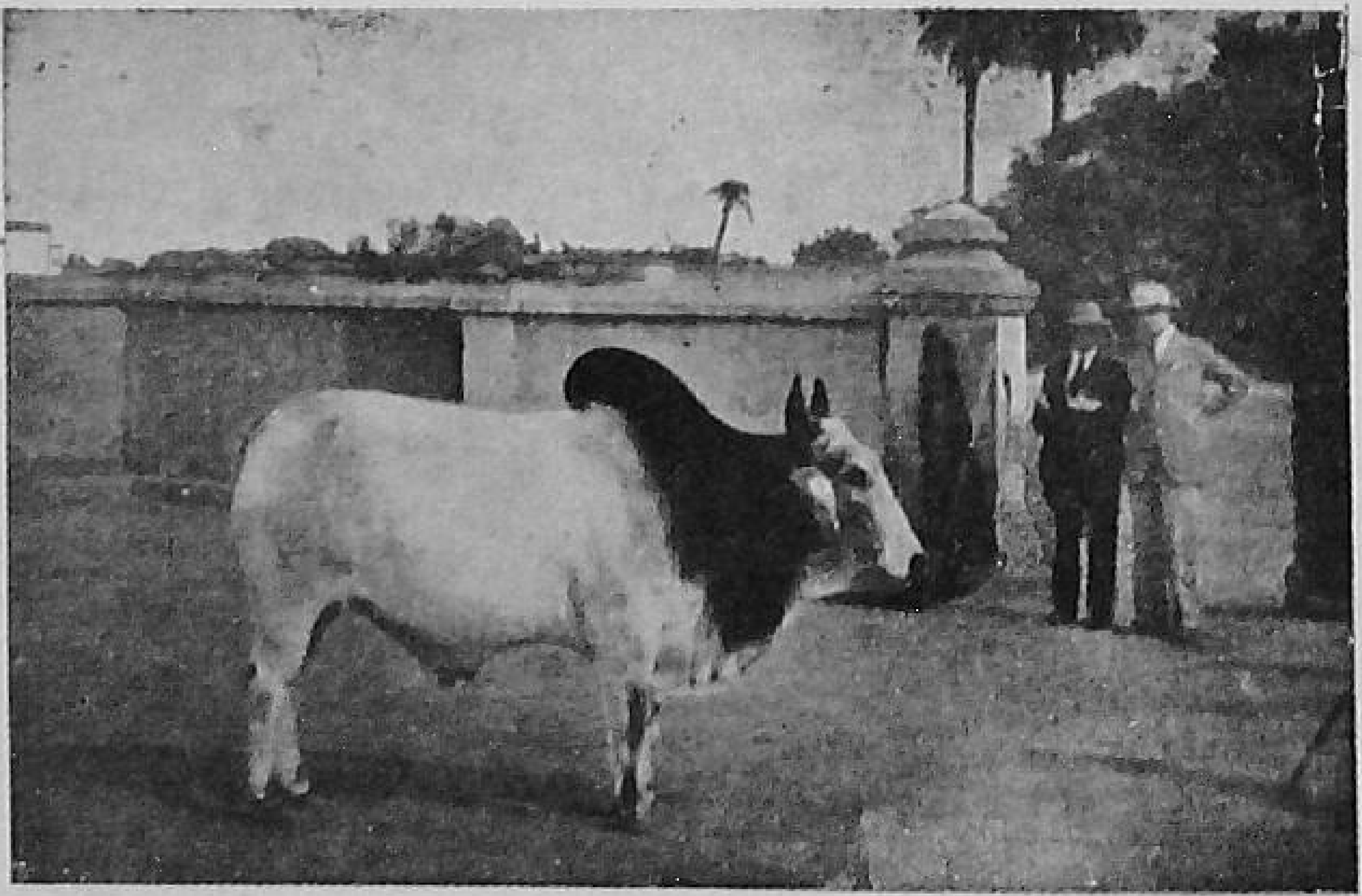
Sahiwal Bull



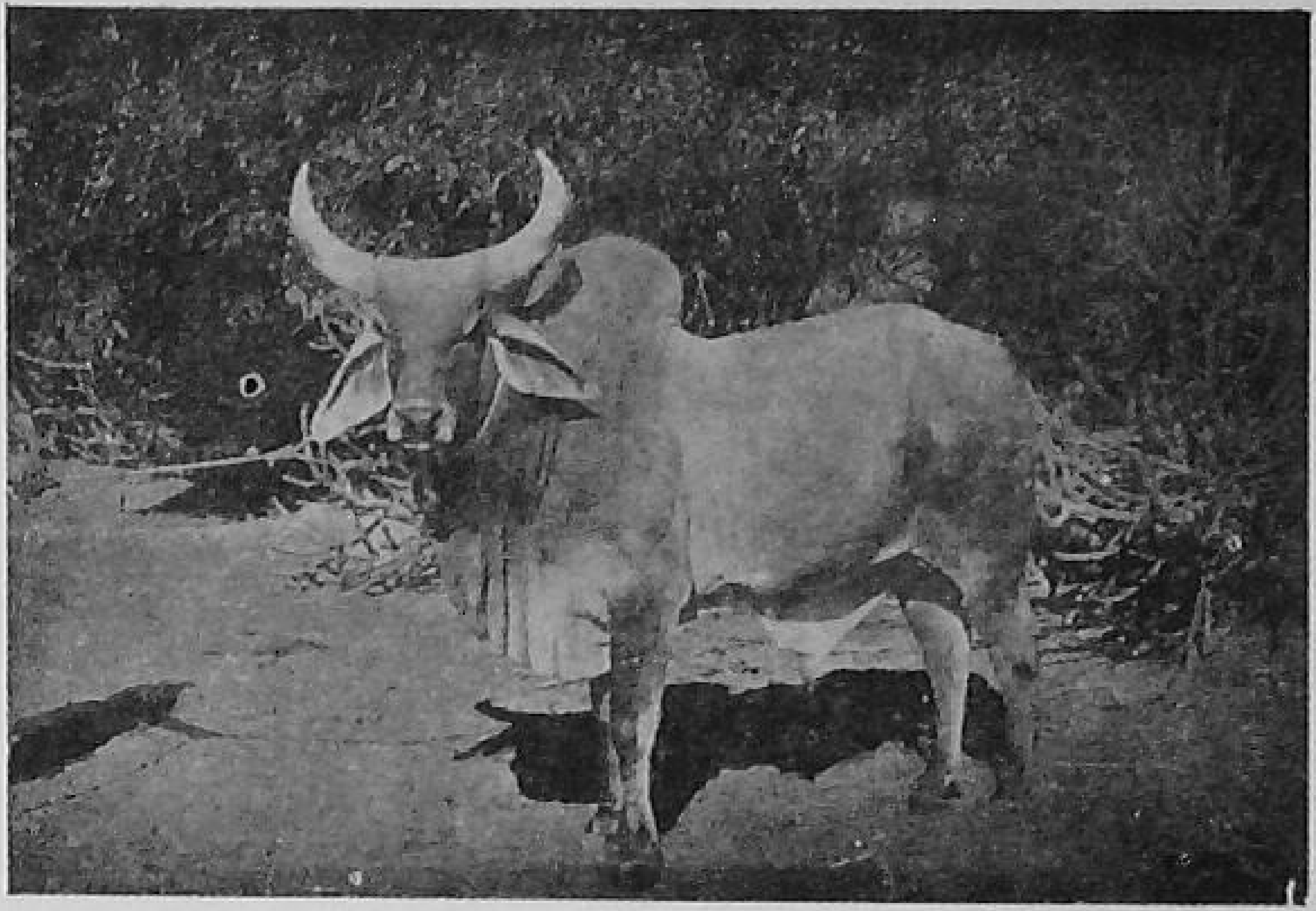
Sahiwal Cow



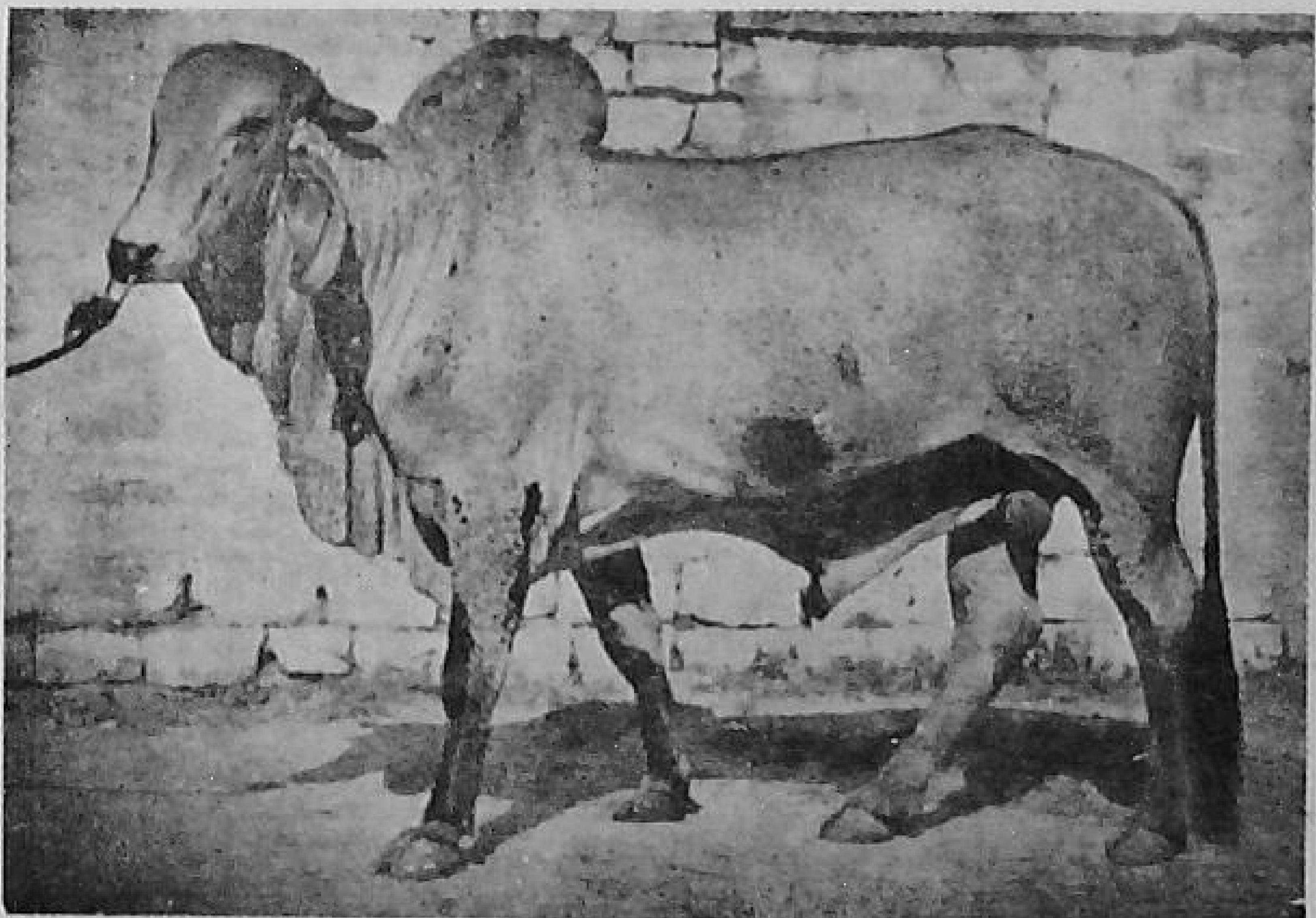
Hariana Bull



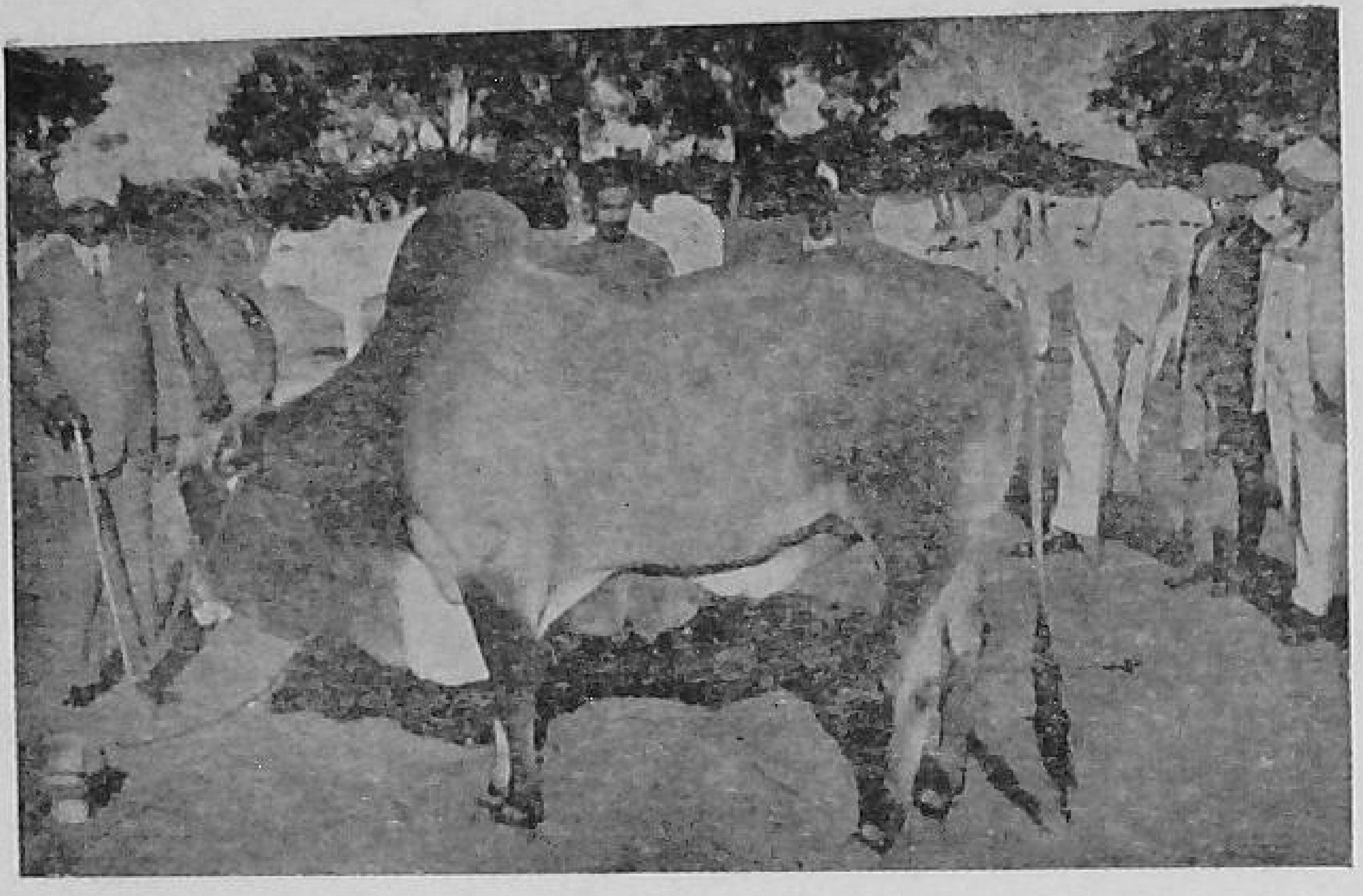
Tharparkar Bull



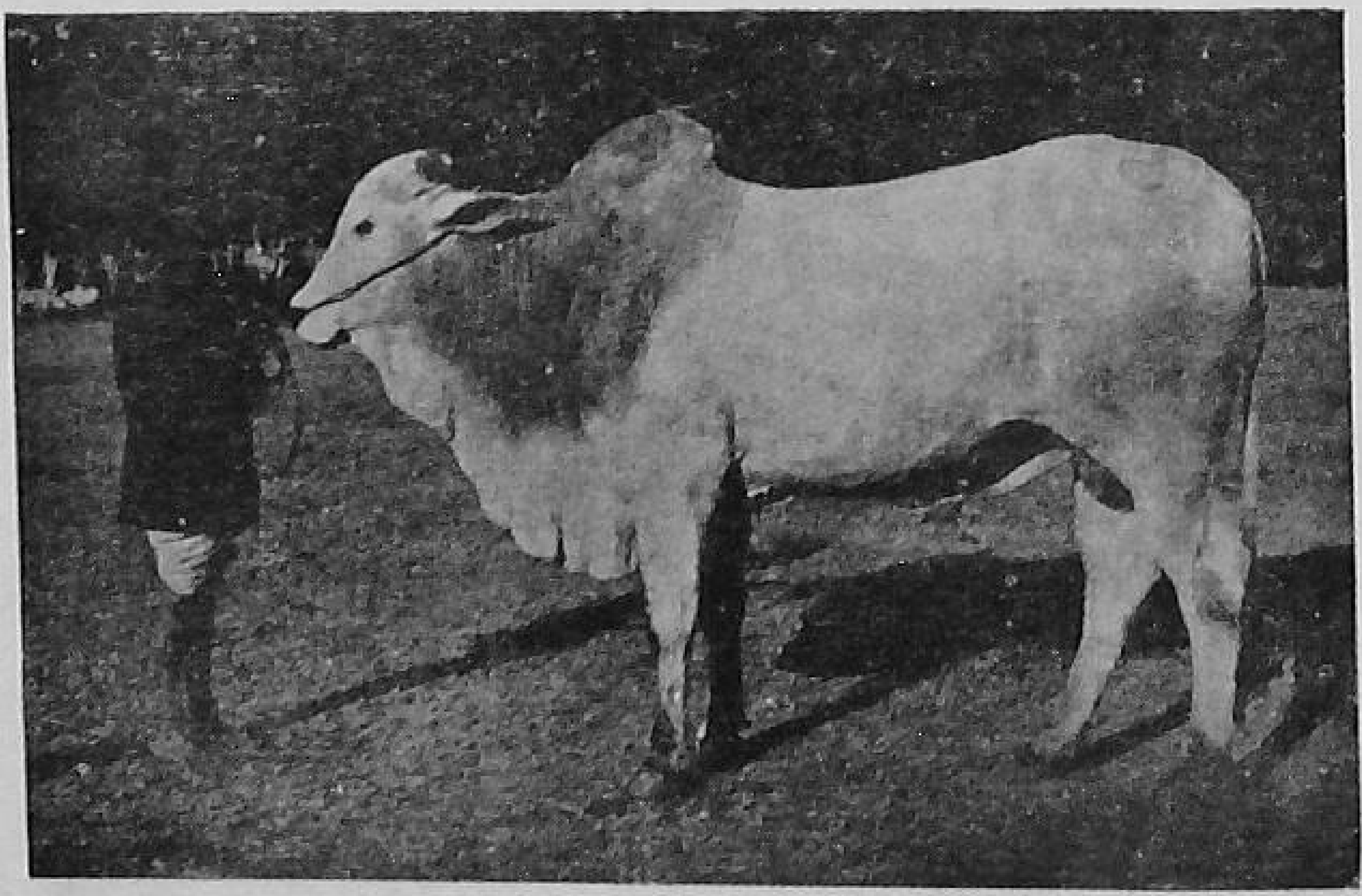
Kankrej Bull



Gir Bull

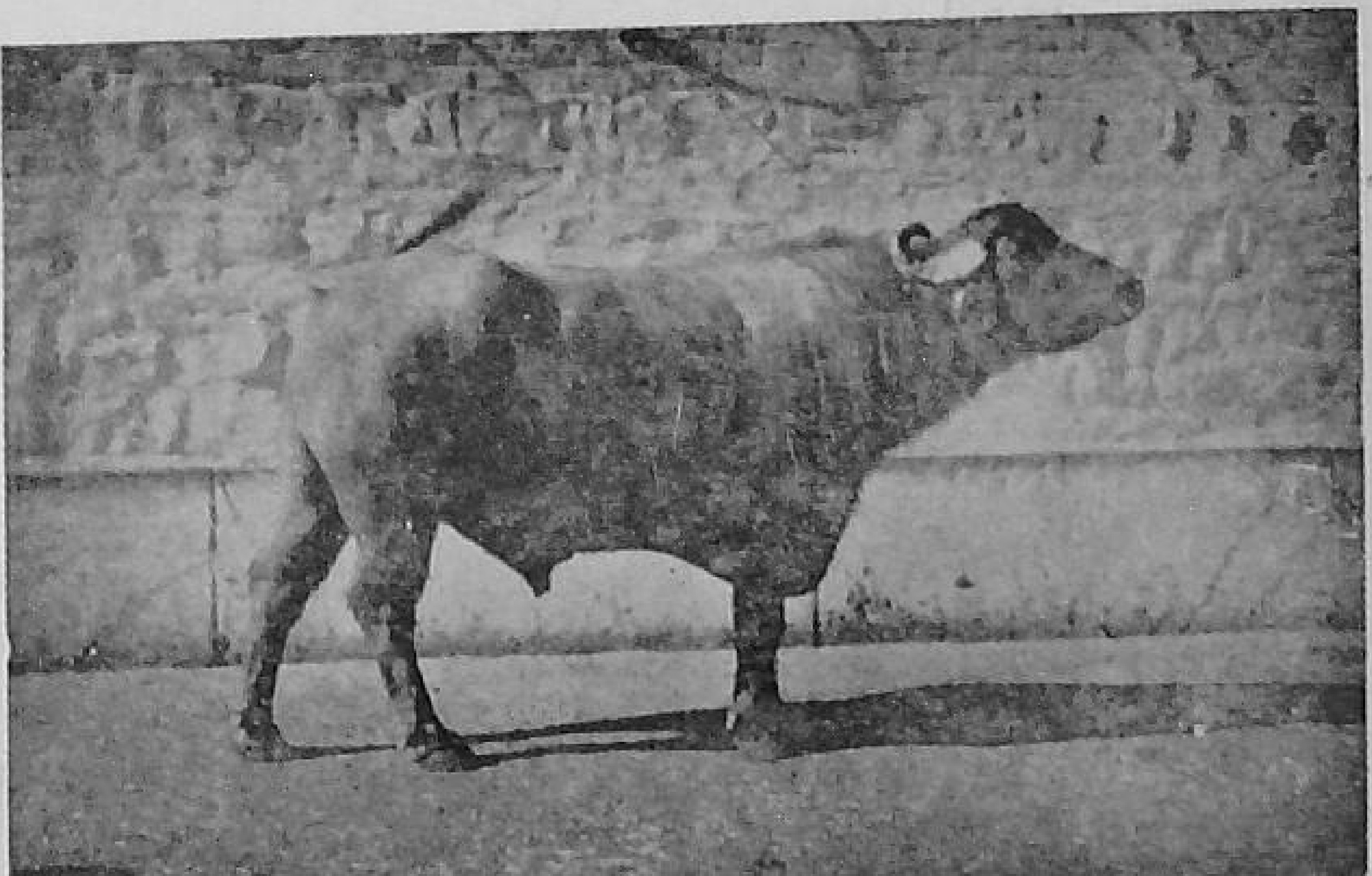


Kangayam Bull



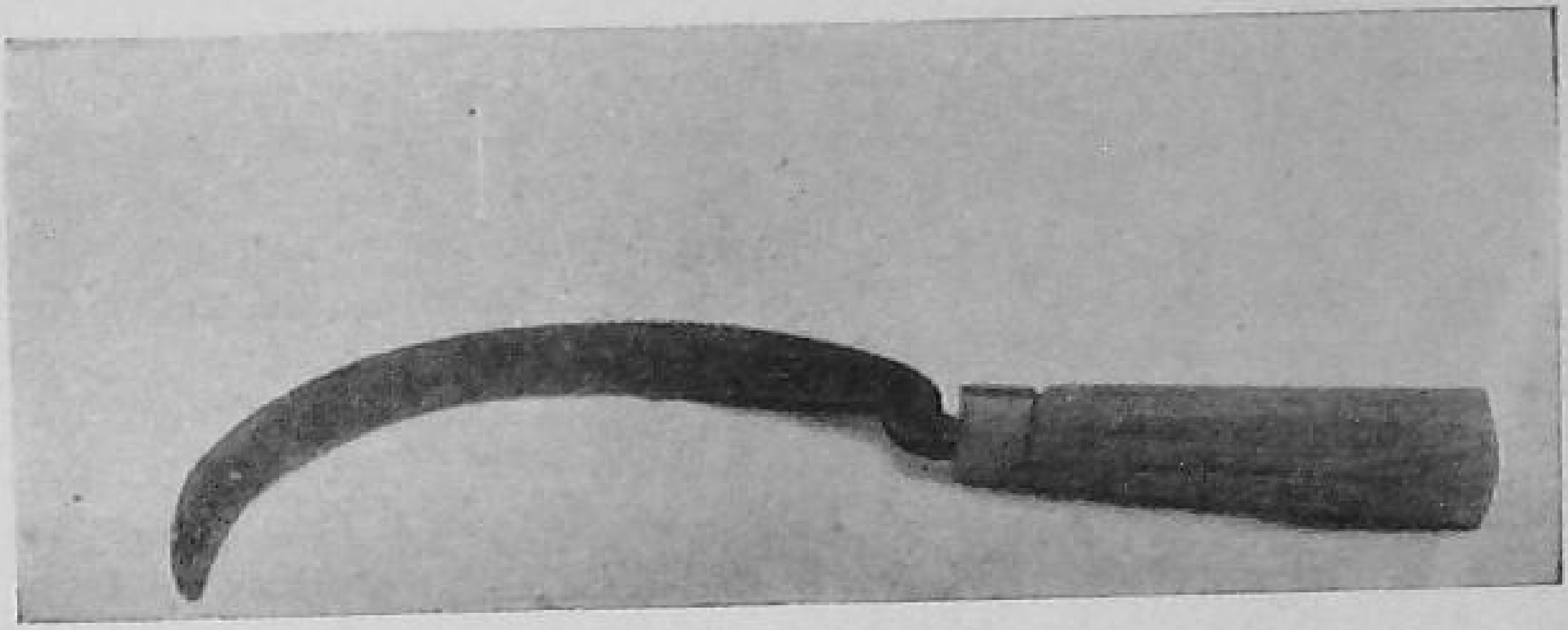
Ongol Bull

Murrah Buffalo-Cow

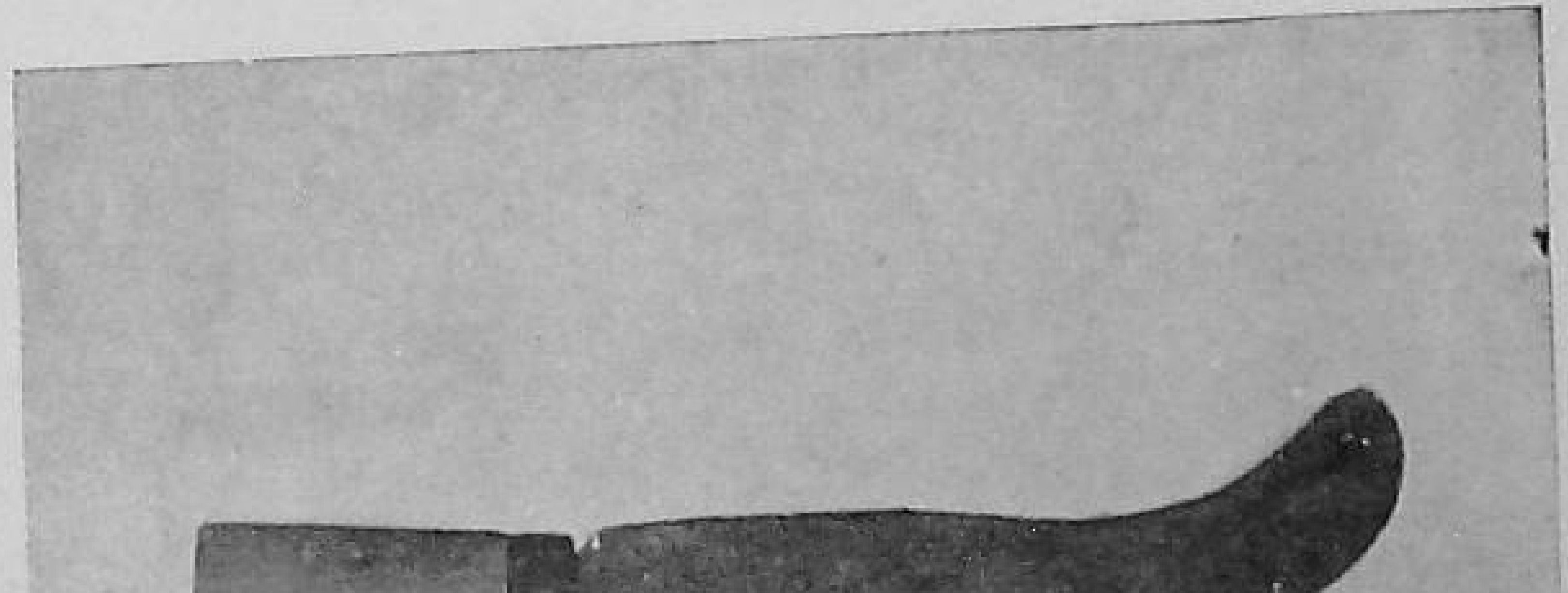


Murrah Buffalo-Bull

Hand operated Karjat rotary hoe for intercultes in paddy



An improved sickle



Bill Hook (*Gandasa*)

moisture conditions and the size and strength of the draft animals. Plough for rice fields are flat bottomed, but they are well adapted for stirring and puddling wet soils. Similarly, the harrows, land levellers, seed drills, interculturing implements and hand sickles are of very simple design and vary but little from place to place.

Only disjoined attempts have been made so far to improve the indigenous implements. During the past 20 years or so, some of the State Agricultural Departments have made an effort to produce, more efficient types of implements or to devise new implements that would make some of the laborious farm operations less exacting. At the same time, animal drawn foreign implements, like soil-inverting mould-board ploughs, multi-tyned seed drills, buck-scrapers, cultivators of various designs, chaff cutters and winnowers have been introduced. However, the progress made so far has been very slow. Recently, power operated machines and equipment, like tractors and tractor implements, oil engines and pumps, cane-crushers, threshers, rice-hullers, groundnut decorticators, etc. have gradually become popular with the well-to-do farmers or primary processors of agricultural produce.

The use of improved agricultural implements means saving of time, labour and money. It also helps better cultivation and thereby increases the yield. The demonstration and supply of improved implements should form an integral part of the programme of agricultural development. The improved implements should be selected on the advice of the State Department of Agriculture and according to their suitability for the crops grown under particular conditions of soil and the cultivation operations required to be performed. The improved implements and machines required to be demonstrated include iron ploughs of various sizes, ridgers, bund formers, wetland puddlers and tramplers, seed drills and cultivators of various types, winnowers, threshers, chaff cutters, Persian wheels, oil engines and pumps, electric motors for pumping water, levellers, etc. Tractors and tractor implements may also be taken up where necessary.

As stated already the progress of the introduction of improved implements has been rather slow. Though heavy initial cost and lack of adequate propaganda and demonstration may be partly responsible for this state of affairs, yet the more important reason seems to be the virtual absence of repair and maintenance facilities in the villages, which are not only distant from town but are also not well served by roads. Supplies of spare parts of implements and machinery and miscellaneous articles like cement, coal and iron should, therefore, be arranged on the spot. Training of drivers and mechanics for oil engines and tractors should be taken up by arrangement with the Agricultural Department. Similarly, training of village blacksmiths and carpenters in the repair and maintenance of improved implements and ordinary field repairs to oil engines, sharpening of plough shares and blades of chaff cutters, etc., should be arranged in the Extension Training Centres as well as training-cum-production centres. The equipment of village smithies should be improved and wherever possible, co-operatives may be organised for the fabrication of improved implements, such as mild steel, mould-board ploughs of simple design,

paddle threshers, rice land weeders, chaff cutters, etc. These multipurpose co-operative societies should also undertake supply of improved implements and where necessary provide required short-term credit for purchasing the implements.

6. **Provision of plant protection** : Plant diseases and insect pests are usually responsible for an undetermined loss in the annual agricultural production. The loss of grains in storage alone is placed at about 10 per cent. The loss in field is often times estimated to be equally great. In epidemic form, these maladies cause huge losses in localised, and sometimes widespread, areas. Remedial measures have been worked out by the State Departments of Agriculture for the principal insect pests and diseases of almost all the major crops, fruit trees and vegetables. The adoption of timely and effective measures to control outbreaks of pests and diseases is essential for obtaining better production. The treatment of *jower* seed with sulphur powder protects the crop, against 'loose smut.' Similarly, the water soaking of wheat seed followed by exposure to hot sun reduces the incidence of wheat smut a great deal. Demonstration of remedial or preventive methods should be given extensively and free of charge. Stocking and sale of dusters, sprayers, fungicides and insecticides should also be arranged. If any disease or pest resistant varieties are recommended by the Agricultural Departments, the multiplication and supply of their seed should be properly organised. Village Level Workers should equip themselves with a working knowledge of the technique of the control of pests and diseases. They should also be provided with necessary appliances and chemicals. In the event of an insect pest or disease appearing as an epidemic, timely mass campaigns should be carried out against them with the help of the farmers. The assistance of the Plant Protection staff of the Agricultural Department should be requisitioned in the conduct of such mass campaigns.

Sometimes the pests and diseases of plants can be controlled by changes in rotation or variations in cultivation practices. As an instance of this nature, mention may be made of the late sowing of cotton as a method of reducing the attact of *tirak* disease. Similarly, the closer planting of cotton usually lessens the attack of *jassids*, and the planting of an early maturing variety of cotton reduces the boll-worm attack.

Yet another method of controlling insect pests is what is called the biological control. In this case, insects living as parasites on specified pests of crops are liberated in the field in large numbers. However, the control of pests by biological methods or by alterations in cultivation practices should be recommended strictly on the advice of the technical officers of the State Department of Agriculture.

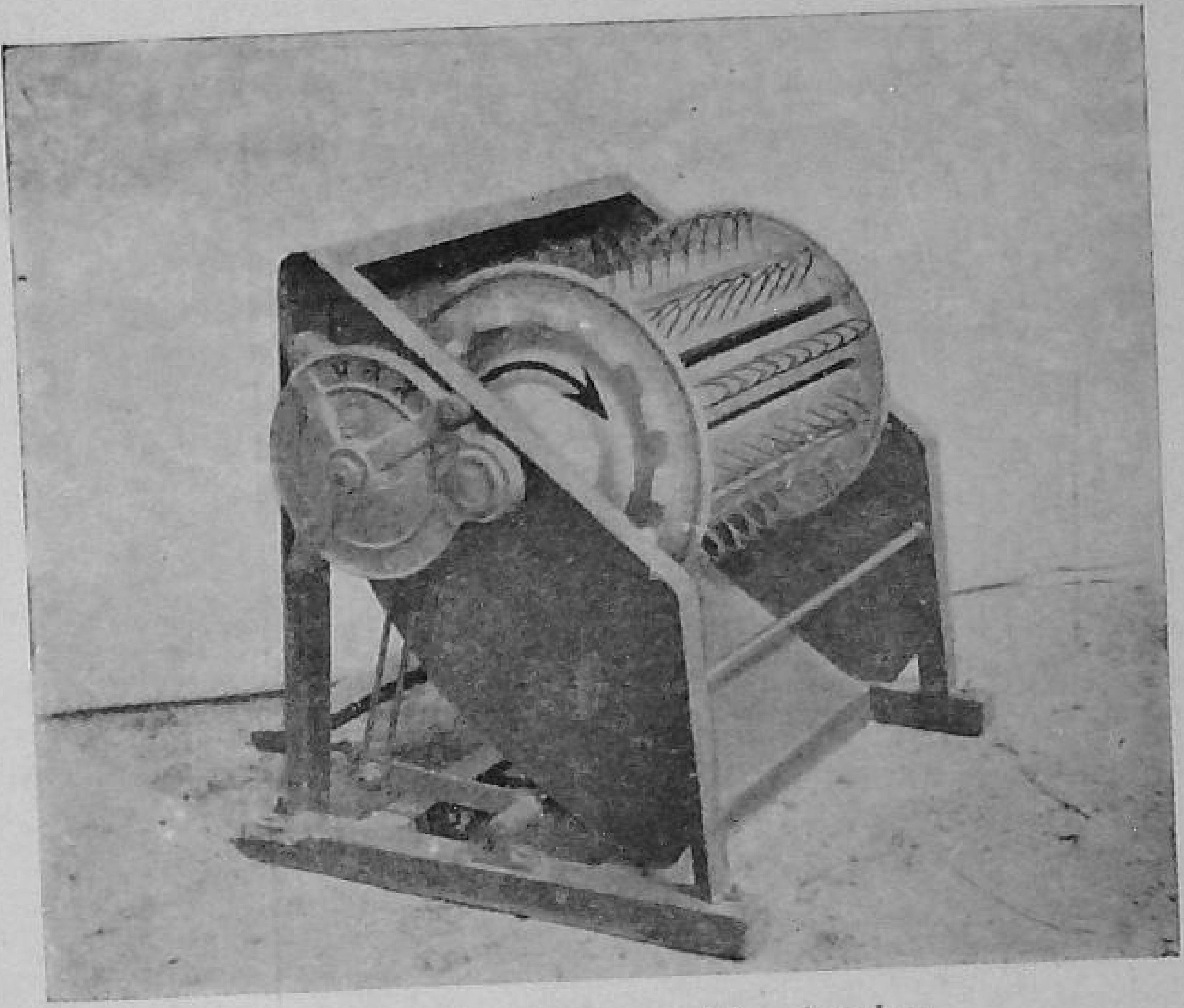
The protection of crops against the ill-effects of pernicious annual or perennial weeds, such as *Pohl*, *Baru* and *Kans*, needs special attention in certain areas. The organisation of mass campaigns for the removal of annual weeds before the *setting* of seeds is one of the easiest methods of cleaning the fields. In the case of *Kans*, tractor

ploughing in the dry season, or repeated blade-harrowing of land in the period from October to May, has proved effective.

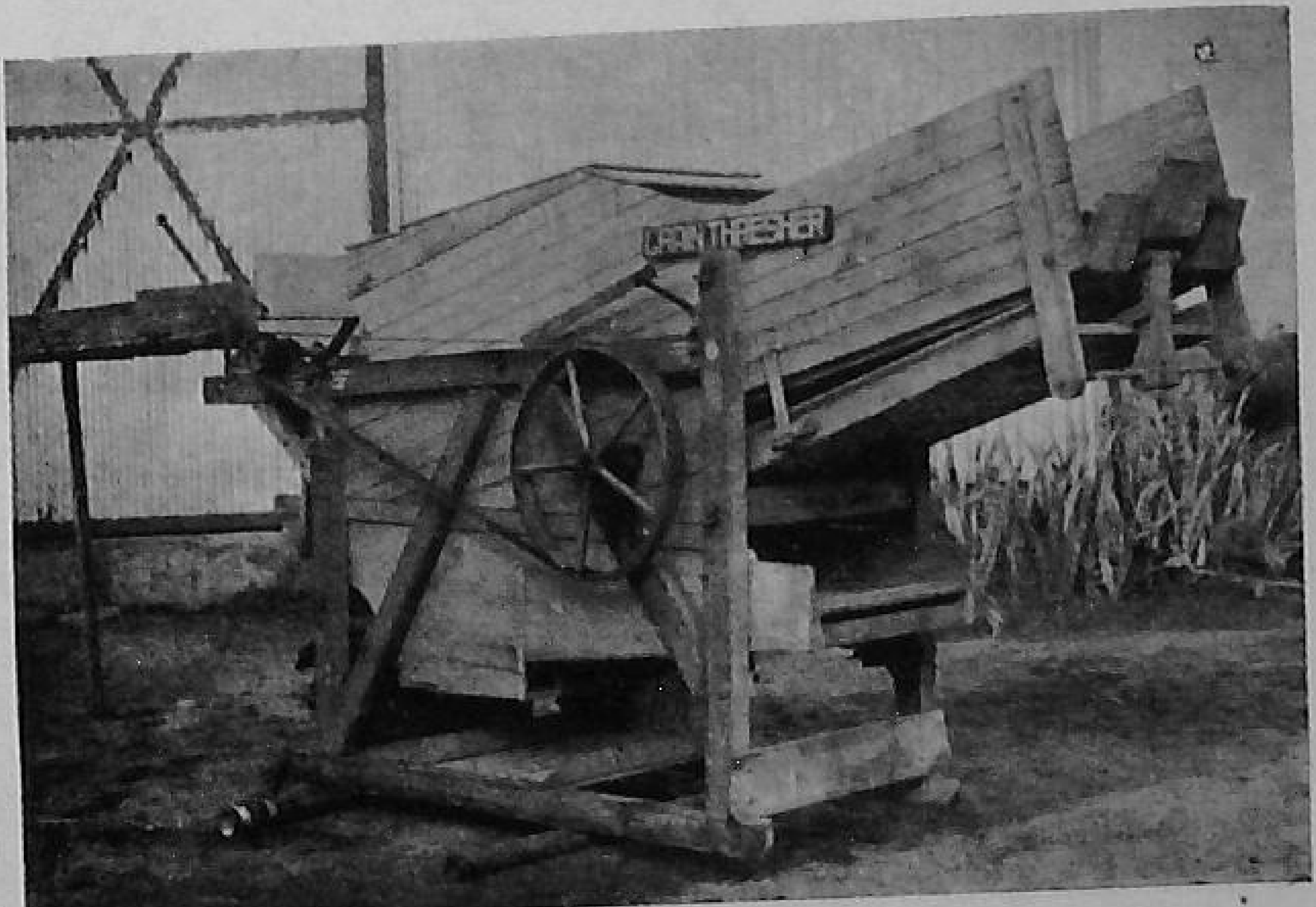
In some localities crops have to be protected against wild animals like jackals, pigs, monkeys or even wild cattle. Shikar parties and gun clubs have to be organised to deal with menace of this kind. Often times field rats do extensive damage to grain crops. Campaigns for reducing the damage caused by rats and other intruders should be organised in consultation with the Departments of Agriculture.

The necessary help and guidance in the protection of stored grain should also be given to cultivators, co-operative societies, merchants and others engaged in the storage of seed and grain in rural areas.

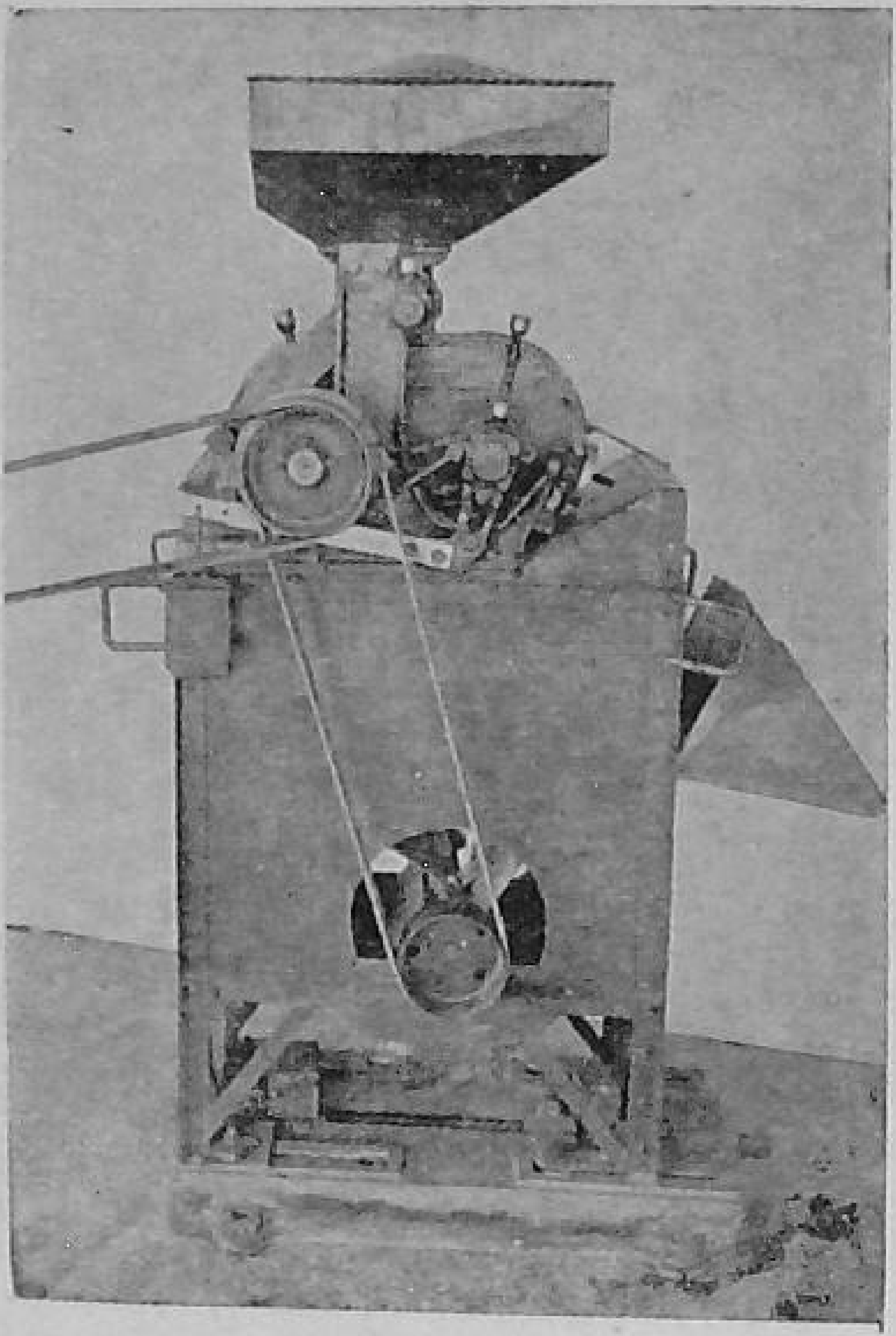
7. **Promotion of fruit and vegetable cultivation** :—The food habits of rural population in practically all parts of the country are defective in as much as they do not include the eating of fruits and vegetables in quantities needed for a well balanced diet. It has been estimated by the Planning Commission that the present consumption of fruits per head per day in India is only 1.5 ozs. and that of vegetables even less, whereas according to nutrition experts, 3 ozs. of fruits and 10 ozs. of vegetables per day are required for balanced feeding. Inadequate and unbalanced food tells heavily on the physique, health and stamina of vast numbers of men, women and children in the rural areas. The expansion of production of these protective foods should, therefore, receive a high priority in the development programmes of all Project areas and N.E.S Development Blocks. Propaganda for extension of areas under fruits and vegetables should be carried out intensively and targets of area and production should be fixed for each farmer possessing irrigation facilities. Old gardens should be renovated to provide for proper spacing of trees and growing of high yielding varieties of superior quality. Lay-out plans for setting up kitchen gardens should be furnished to those who desire to have kitchen gardens of their own. People should also be given instruction in the art of growing the desired vegetables and fruits. Co-operative nurseries should be set up for the supply of reliable seedlings, grafts and seeds, if the Agricultural Departments are not in a position to supply the same in required quantity or numbers. Where Agricultural Departments have their own properly organised nurseries, steps should be taken to expand their operations to meet the increased needs of the Project areas. Supplies of proper manure and garden implements should be organised through the Co-operatives or Agricultural Department, as the case may be. Demonstrations of the proper technique of growing, manuring and irrigation of recommended fruits and vegetables should be given freely. The Village Level Workers should have a good knowledge of the proper methods of pruning, training, budding, grafting, weeding etc. They should ensure that these operations are carried out properly in individual gardens to obtain high yields. Crown grafting of wild or low quality fruit plants with better varieties should also be taken up. Adequate arrangements should be made for the control of insect pests and diseases attacking fruits and vegetables.



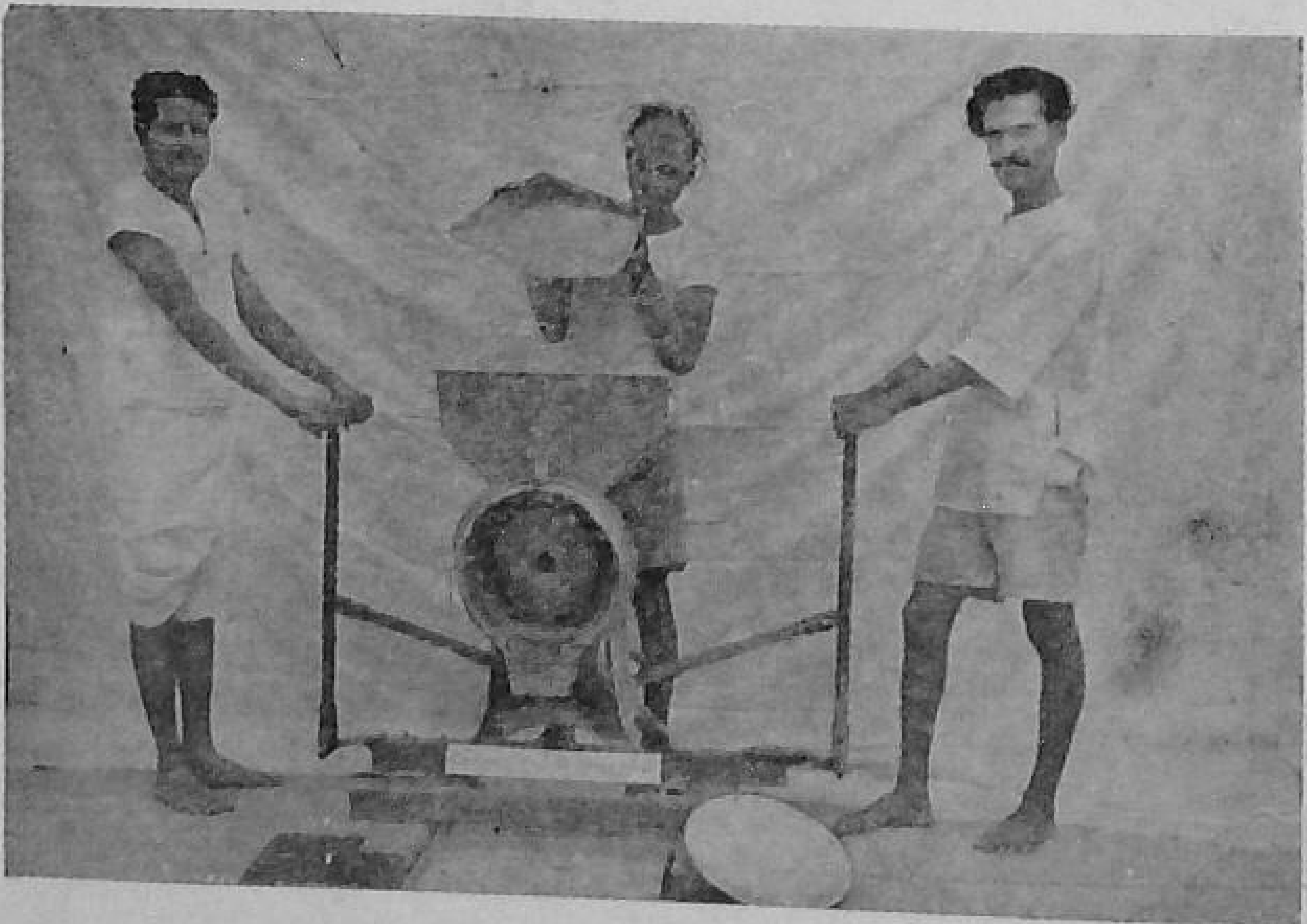
"Dania" Japanese paddy thresher



Grain thresher

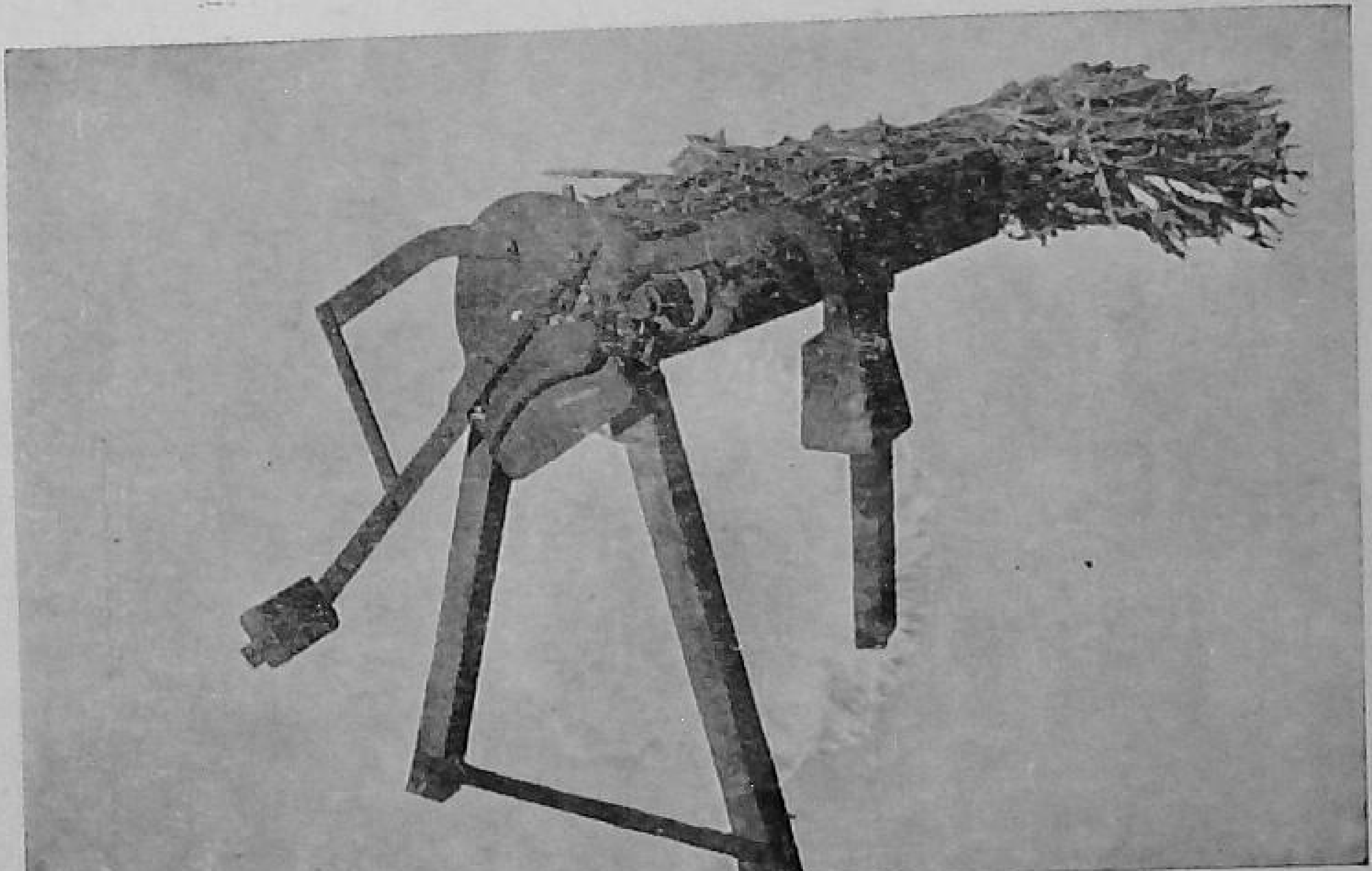


Power operated paddy huller

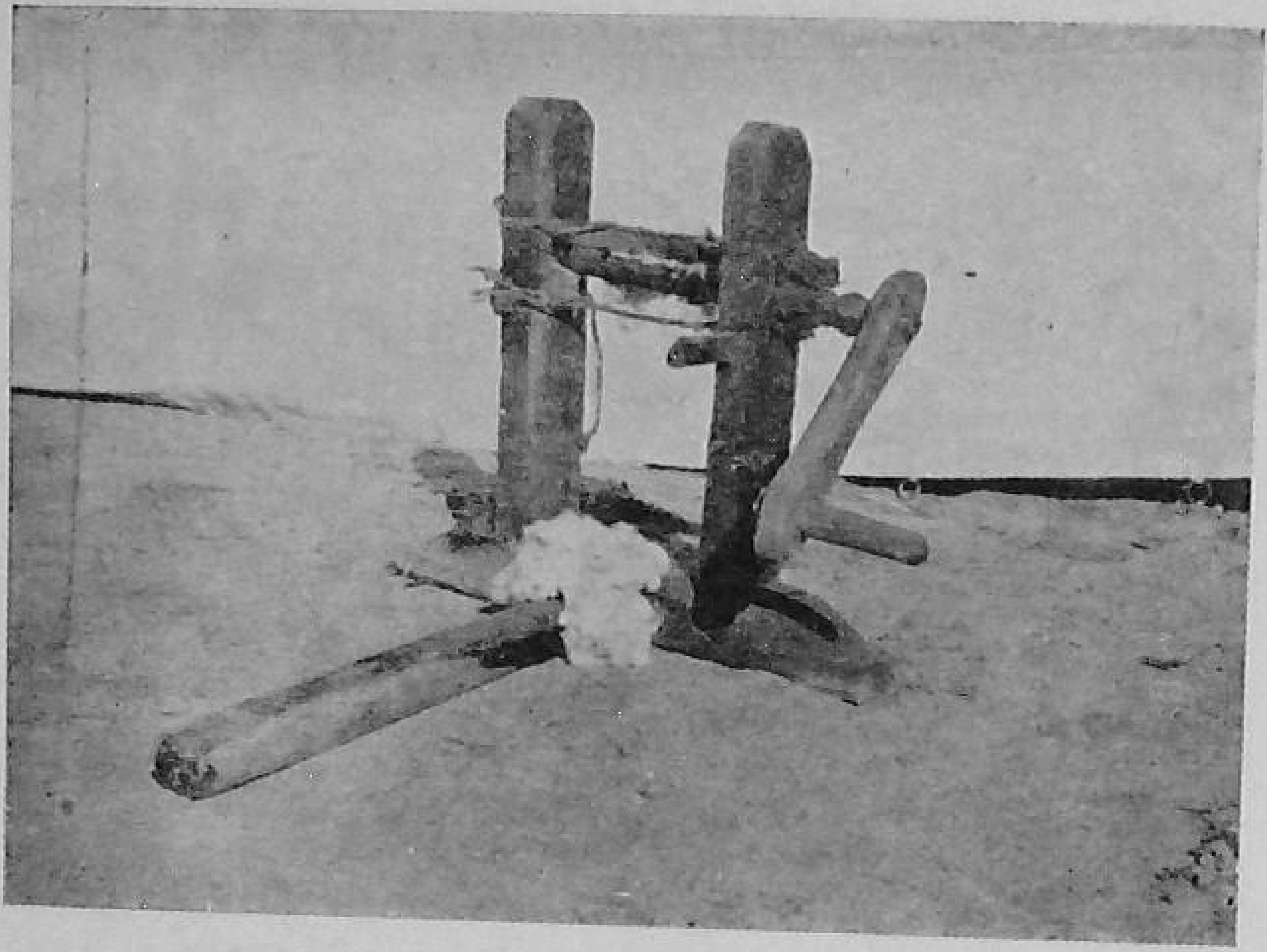


Hand operated paddy sheller

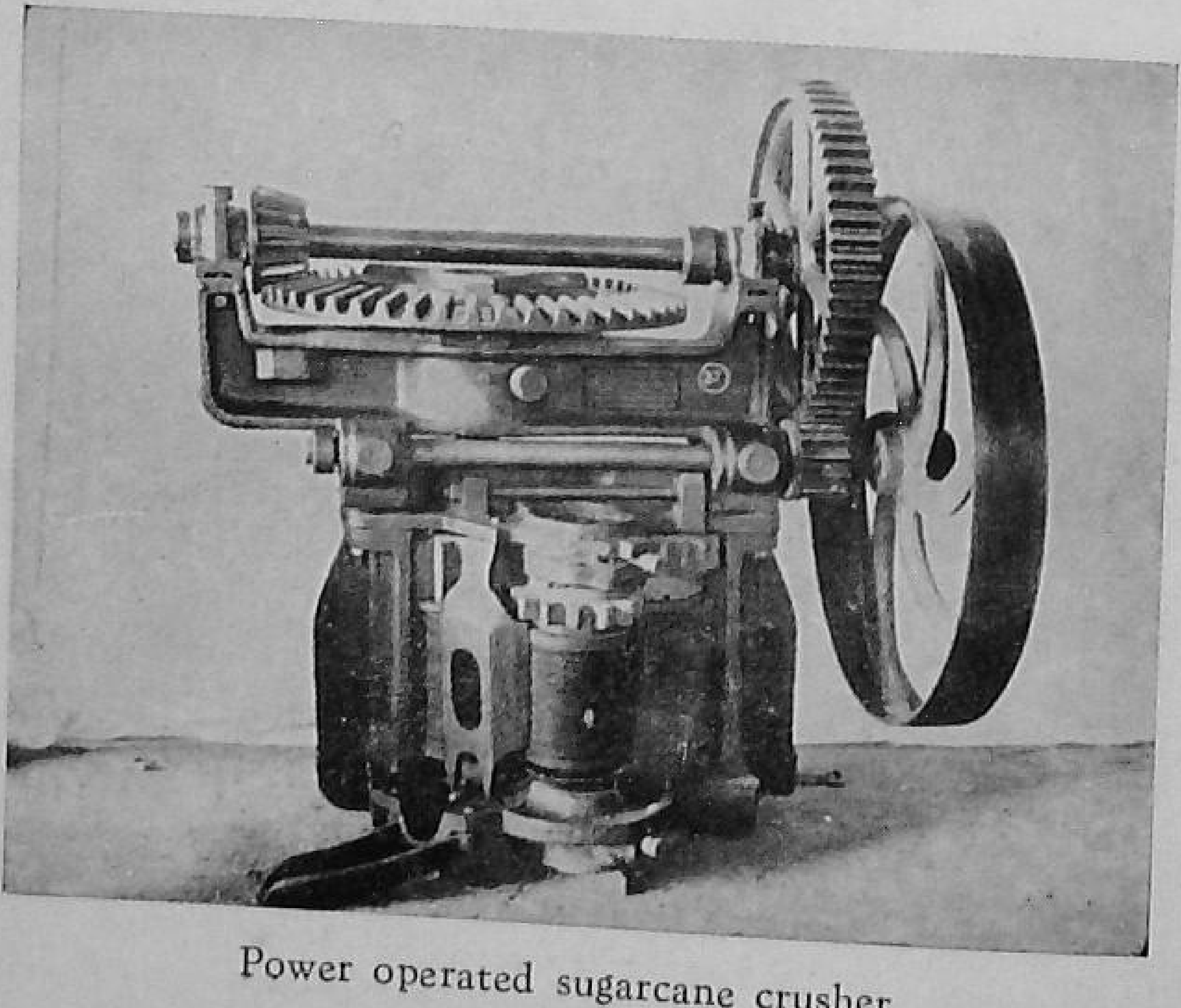
Hand operated chaff cutter



Pedal operated chaff cutter



Cotton hand gin



Power operated sugarcane crusher

Country bullock cart (iron-tyred wooden wheels)

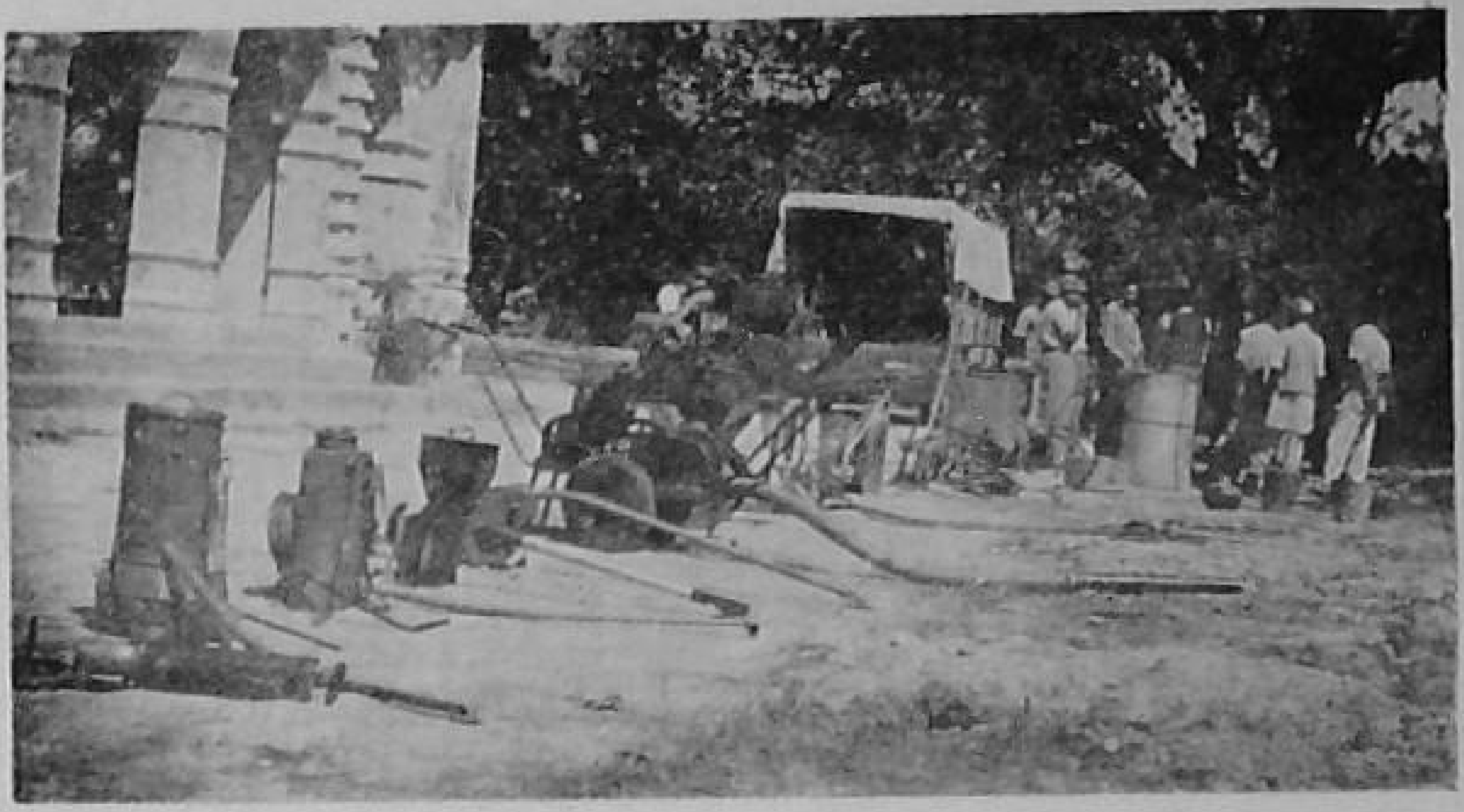
Pneumatic tyred bullock cart

In the expansion of production of fruits and vegetables, care should be taken to avoid local gluts. Varieties with different periods of maturation should be grown. Vegetable sowings should be spaced in time, and the types that can stand transport should find a proper place in cropping. Suitable marketing arrangements should be made to secure the orderly and most remunerative disposal of produce. Steps should also be taken for conserving surplus production by cheap indigenous methods of drying fruits and vegetables and preparing squashes, jams, jellys and preserves. Necessary training for the purpose should be given by the production-*cum*-training centres. If possible, community centres may be set up for processing of surplus produce.

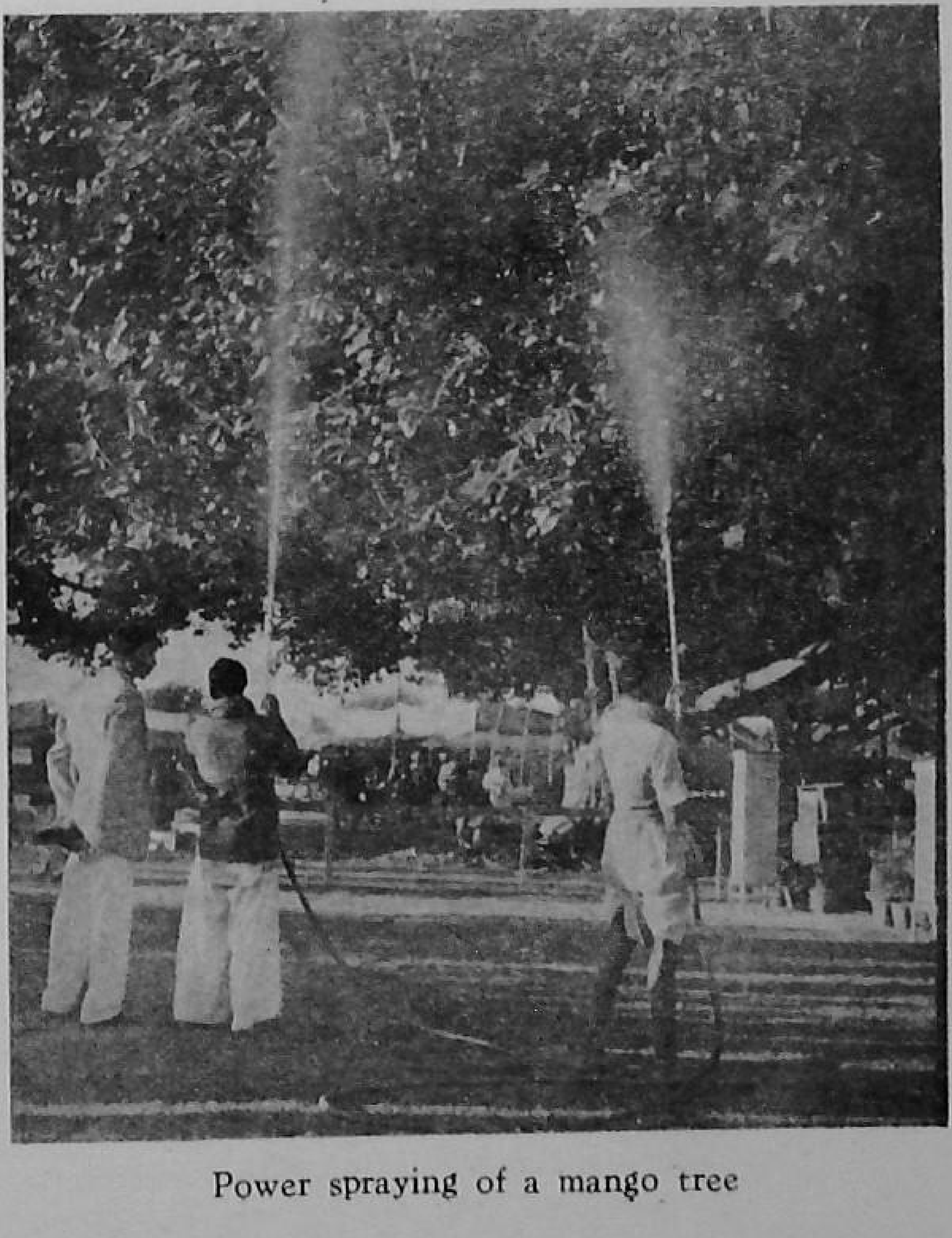
As regards the extension of area under fruits and vegetables, emphasis should in the first instance, be laid on the planting of common fruits and vegetables known to be growing successfully in the neighbourhood, and also on garden crops like onions, garlic, potatoes, and chillies, the produce of which can stand storage and transport. Quick growing fruits like *papayas* and bananas should also receive preference. Potato cultivation can be extended a great deal in sandy beds of streams in which a good deal of sub-soil water is available close to the surface even in the dry winter months from October onwards.

8. **Reclamation and land development** :—Small or large areas of cultural waste land exist in almost all parts of the country. The reasons for land remaining derelict are many and varied. The land may have remained uncultivated due to the tract being thinly populated, or it may have gone out of cultivation because of invasion by deep-rooted pernicious grasses and weeds like *kans*. In some tracts, heavy erosion has made the soil infertile and submarginal so that its economic cultivation is no longer possible. In still other cases, the accumulation of deleterious salts may have made the soil saline and unfit for cultivation. The march of desert in certain areas and extension of water logging in others may be responsible for a similar result. Finally, the repeated failure of rain in a few successive years, or a prolonged depression in prices of agricultural produce may force arable land out of cultivation for varying periods.

Due to the variety of reasons mentioned above, the problem of land reclamation in different Project areas will vary both in nature and urgency. In thinly populated flat country, the holdings may be already large, and, therefore, the need for bringing additional land under the plough not so urgent. Reclamation in such localities, if found necessary for some reason, will have to be undertaken by mechanical means like tractor ploughing, or by setting up new colonies of landless farmers, or of farmers hailing from thickly populated areas elsewhere. The new colonists will need to be given adequate guidance and material aid to reclaim land. However *the actual urgency for reclamation should be the first criterion for undertaking this work in thinly populated areas.* If expansion of production can be brought about more economically and expeditiously by increasing the yield of land already under cultivation, it should receive first preference.



Sprayers and dusters for plant protection



Power spraying of a mango tree

In high rainfall tracts having ill-drained heavy soils, large areas of land have gone out of farming because of the difficulty of clean cultivation during the rainy season. Deep rooted hardy grasses like *kans, kunda* and *hariali* have established firmly on such soil and driven it out of cultivation. Vast tracts of weed infested land of this kind are met with in Madhya Pradesh, Bhopal, Madhya Bharat, Karnatak and some of the adjoining States. The reclamation of such abandoned land requires the eradication of weeds by deep ploughing with heavy tractors. In areas where reclamation of weed infested land is urgently needed and farmers are ready to bear the cost of reclamation work, arrangements should be made with the Government of India's Central Tractor Organisation for undertaking the job. Financial assistance by way of loans to owners of land required to be reclaimed may be given wherever necessary.

In some parts of Bengal, land has gone out of cultivation because it has become marshy due to impeded drainage. Drainage of such marshes, followed by tractor ploughing and proper cultivation is necessary for making the soil once again arable. Minor reclamation schemes of this nature may be operated as a part of the Community Projects programme, but major schemes covering large areas and involving huge expenditure will naturally have to be taken up by the State Government as part of its own land development programme.

The severe erosion of soil, particularly in a hilly, undulating tracts, is responsible for the loss of fertile top soil. Large areas in Bombay, Hyderabad, Assam and some other parts of the country have suffered badly in this manner. Contour bunding and terrace cultivation are necessary for the reclamation of such undulating eroded land. Project areas should be surveyed to locate compact blocks of eroded soil, and schemes of contour bunding or terrace cultivation prepared. Land development and soil conservation measures of this type should be organised as far as possible on the basis of complete water-sheds and not for individual holdings.

Heavy gully erosion has also thrown out of cultivation immense areas on the banks of some of the rivers that traverse the soft alluvial tracts of Northern India. The severity of erosion of this kind has only to be seen to be believed. Hundreds of thousands of acres, cut up by deep ravines, are found along the banks of river Chambal and Jamuna. The reclamation of such deeply eroded land by mechanical means or paid labour is a very costly process. Where landless labourers are available in abundance, they may be found willing to reclaim such eroded land if it is allotted to them free, and assistance is given to them by way of cattle, seed, manure, etc., for bringing under cultivation the land which they may gradually reclaim with their limited resources. Reclamation of this type should invariably be accompanied by proper anti-erosion measures in the high lying adjoining cultivated lands to prevent further erosion.

Reclamation of saline or *khar* lands on the sea coast is in progress in some of the coastal districts of Bombay State under special schemes operated by the State Government. In the Project areas where reclamation of *khar* land is a serious problem, advantage should

be taken of the facilities given under these schemes. Reclamation of saline lands in other parts of the country has not yet been taken up on a really large scale. Individual cases when reclamation appears to be an economic proposition, technical and other help, may be given to farmers who desire to reclaim saline or alkaline lands. This work should be undertaken with the help of and in consultation with the State Agricultural Department.

In Rajputana, Cutch and central parts of Saurashtra, the gradual extension of desert conditions has driven large areas out of cultivation. The prevention of the march of desert is necessary for the reclamation of such land. Planting of belts of quick-growing trees will stem the expansion of the desert areas. The trees selected for planting should be such as can grow well on poor soil and withstand low rainfall conditions and continued shortage of soil moisture. *Prosopis guliflora, Ailanthas excelsis, Calotropis, Munj* grass and some varieties of *Zizyphus* (Ber) are plants of this type. For the names of other suitable trees, the assistance of the Desert Afforestation Research Station, Jodhpur or of State Forest Departments should be sought.

In some Projects, hill slopes denuded of forest cover, will require attention. In such instances, trees should be planted in contour trenches dug on hill-sides across the slope. In many Projects, the reclamation and rejuvenation of village grazing lands is urgently called for. Grazing and tree cutting in village commons has been so continuous, indiscriminate and merciless that these so called grazing lands are today no better than treeless, grassless, wastes during a greater part of the year. They are mere exercising grounds for cattle, providing only a small quantity of poor quality grass during the rainy season and one or two months after it.

Village pasture lands should be reclaimed and improved by rotational grazing. The area concerned should be divided into three or four parts and properly fenced. Cattle should be allowed to graze on them in turn every year, allowing time for the re-establishment of grass. Seed of suitable fodder grasses and leguminous plants should be obtained from the local Agricultural Departments and sown in these fenced plots to improve the nutritive value of the grass cover.

The proper development and cultivation of reclaimed land is absolutely necessary to prevent its going out of cultivation again. Contour bunding, terracing, compartment bunding, contour cultivation, strip cropping of spreading and erect crops, and proper manuring are the principal measures that should be adopted in this connection. The main objective after reclamation of eroded land should be to arrest further erosion and to conserve soil moisture as well as fertility. Provision of proper drainage in the rainy season and repeated cultivation in the summer months will prevent soils becoming weedy again. If the soil is highly eroded and unfit for the growing of field crops, the above said anti-erosion measures should be accompanied by the planting of belts of leafy trees which will protect soil from the impact of heavy rain. Roots of trees also firmly hold soil in place and add humus to soil surface, thereby helping

Dusting "Dusting Gammaxene" on a resting Locust swarm

Fumigation of rat holes with Cyno-gas

Garden Tools

water-conservation and increasing soil fertility. Planting of trees will also act as a protection against floods and silting. In areas where erosion is not serious, trees should be planted on boundaries of fields, around irrigation wells, and along bunds and water-channels. The trees selected for planting should be such as would meet the cultivators' requirements of fuel, fodder, timber, green manure, fruit and shade for cattle.

9. **Better management of farms and farm business** :—For securing full benefits of agricultural development work, efficient management of farms and farm business are as necessary as the application of improved technique. Defective farm management and the inability to secure the best price for one's farm produce will wipe out the benefits of increased production arising from the improvement of cultivation methods. The establishment of co-operative farms is being attempted in some places and that of 'model farms' and 'model villages' has been suggested in others. For establishing a 'model farm', a progressive cultivator owing an *average holding* dry or irrigated as the case may be, should be selected, and all items of improved farming should be applied to his holding. The selection of cultivators for the purpose should be done on the recommendation of the village panchayat. The existing status of farming in the selected holding should be carefully assessed. An improved cropping scheme, covering a period of two or three years, should then be prepared giving effect to all improved practices recommended by the Agricultural Department of the State. Records should be maintained of expenditure incurred on each item of development, the increased yields obtained, and higher monetary returns, if any. The results of the application of all improved agricultural and animal husbandry practices will indicate the possible benefits that an average farmer can derive by the adoption of improved farming methods. The residents of the village should be taken to the 'model farm from time to time to see for themselves the economic benefits accruing from the simultaneous application of improved agricultural methods.

Similarly, one village in each Block should be selected for development as a 'model village'. All measures recommended for the improvement of agriculture, public health, education, cottage industries, communications, social education, etc. should be adopted in this village in the most intensive manner. The existing agricultural and social conditions in the village should be surveyed before development work is initiated. This will provide a measure of comparison of the existing conditions with those that may result from the intensive development work proposed to be carried out. The model village as it will eventually emerge will serve as an ideal for other villages in the Project area. Village leaders from the remaining parts of the Block should be given frequent opportunities of seeing for themselves what can be done for changing the existing conditions by a concentrated all round effort. Community effort and self help should be the foundations of this comprehensive development work.

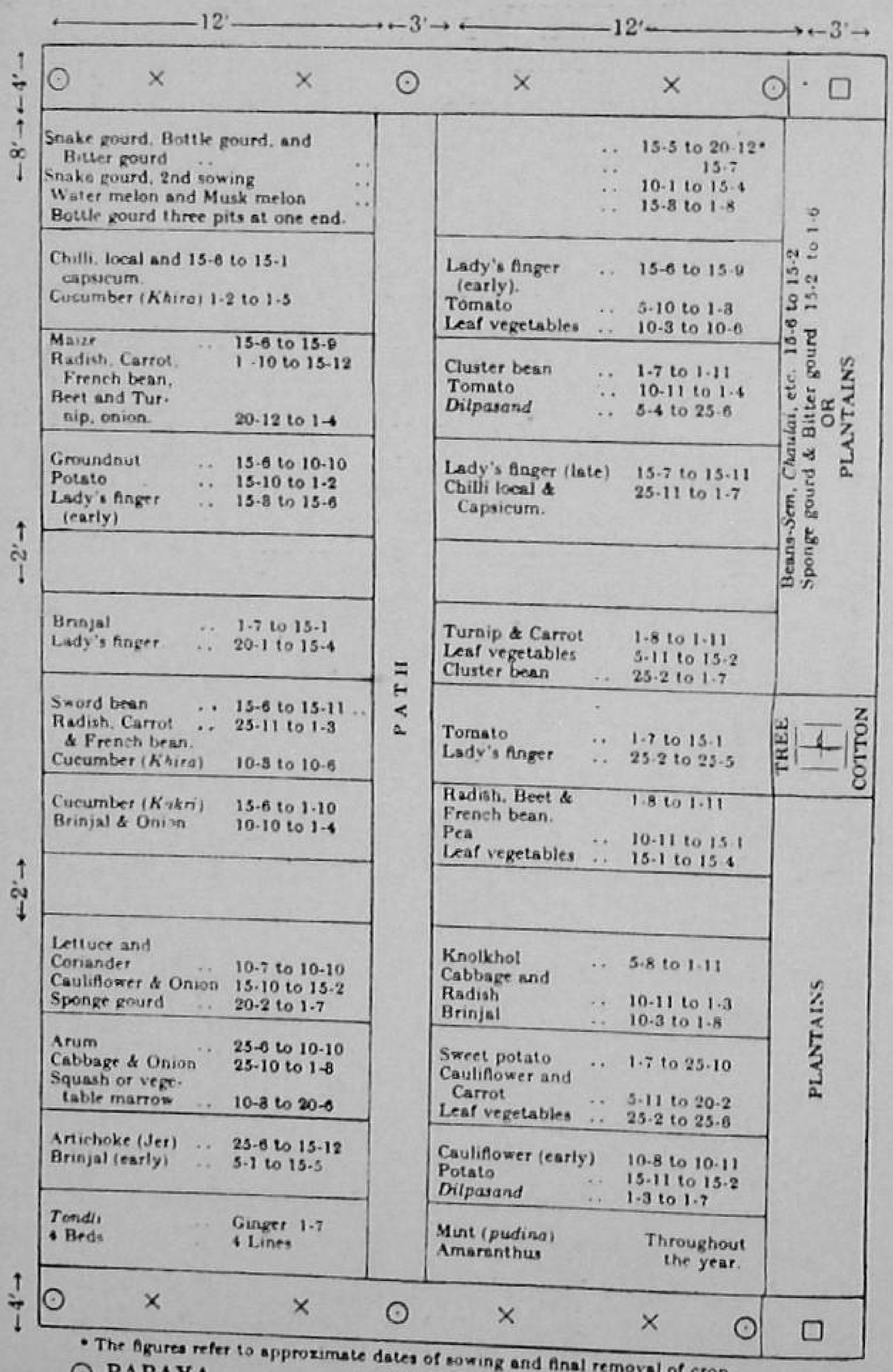
The setting up of multi-purpose co-operative societies for providing short-term credit for the purchase of improved seeds,

manures and farm equipment at the lowest possible cost and for the orderly marketing of agricultural produce at the highest obtainable price is urgently needed. Co-operative organisations already exist in large numbers in many of the Projects, but most of them are not functioning properly for one reason or another. These societies should be revived and made live institutions taking an active part in all development work. Every Village Level Worker should have at least one efficiently working multi-purpose co-operative society at his headquarters. The inadequacy of short-term credit is one of the principal causes responsible for the slow progress of improved varieties, manures, cultivation practices etc. The grading of produce, its orderly marketing and the cutting out of the middle men's profits will result from the institution of co-operative marketing. The production and marketing of milk, milk products, vegetables, fruits and eggs are particularly well suited to co-operative handling. The cost of transport, storage and other handling is reduced to the minimum in such cases. Common arrangements can also be made for cold storage of surplus production. The co-operative marketing of such produce can usefully be combined with the co-operative purchase of cattle and poultry feed, manure, reliable seed, grafts and seedings, and plant production equipment. The establishment of co-operatives is also necessary for the continuation of the development work initiated in the Project period, and the maintenance and repair of tanks, channels, school buildings, dispensaries etc., after the Governmental organisations are withdrawn or reduced in size.

10. **Improvement of live stock and animal husbandry :—** As in the case of agricultural development, no uniform programme of work for improvement of cattle and animal husbandry can be prescribed for the country as a whole. The conditions obtaining in the different parts of the country and the needs of the farmers in respect of cattle, dairying, poultry farming, sheep-breeding etc. are highly varying. Only general outlines of a programme can be indicated. In consultation with the State Veterinary and Animal Husbandry Department, the Project authorities, should select only such items as are best suited to the actual conditions and are considered more urgent by the representatives of the farmers themselves. The programme of work, the targets to be achieved and priorities to be assigned to items should be prepared with the concurrence of the Project Advisory Committee. This alone will secure the people's enthusiastic and whole hearted participation, which is absolutely necessary for the success of any programme of development. Subject to these limitations, the following items should be taken up for improvement of livestock and development of animal husbandry.

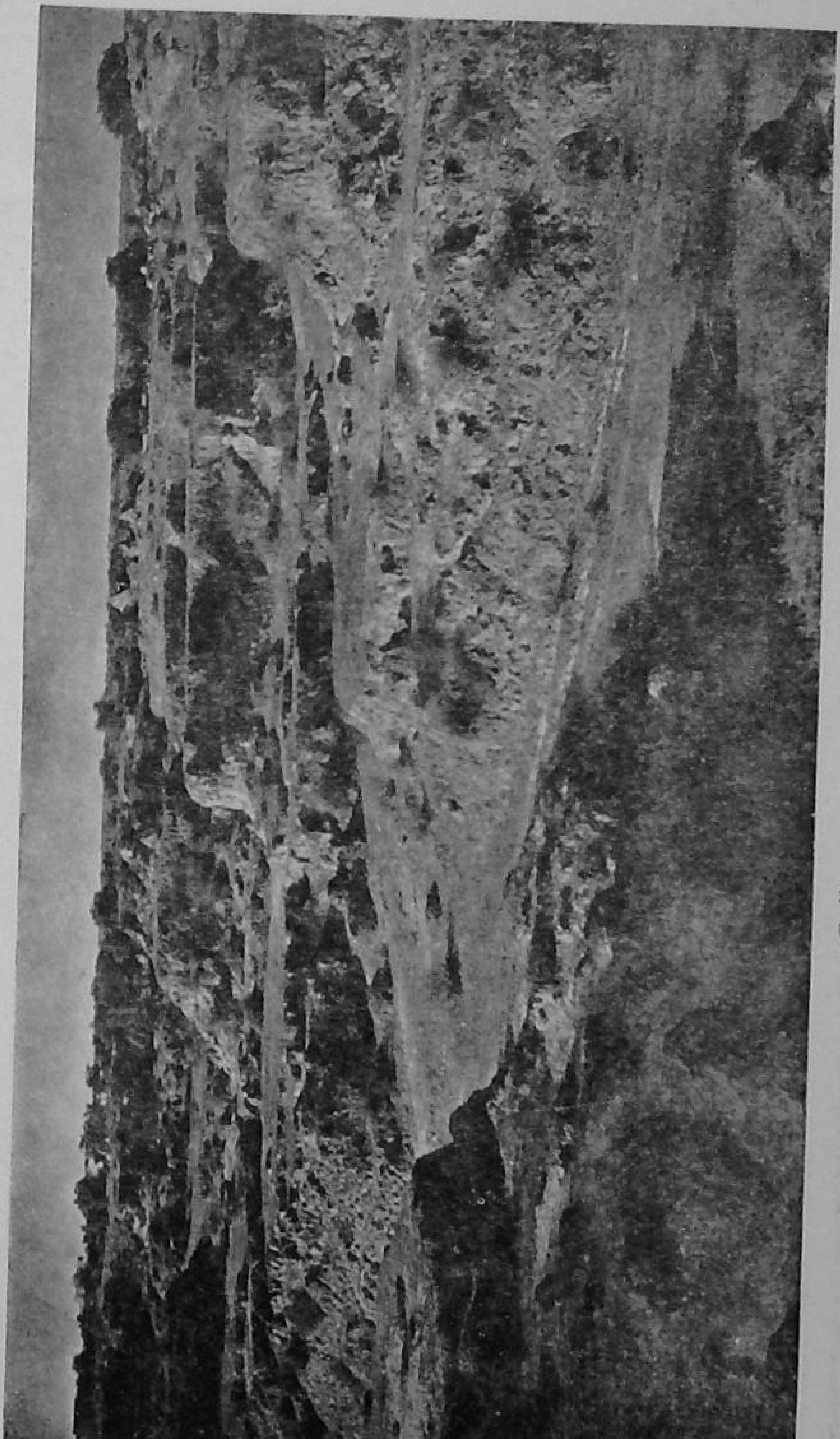
11. **Upgrading of cattle** :—The agricultural economy of India depends a great deal on bullock power and it is likely to remain so for many years to come. Bullocks supply the motive power for almost all agricultural operations and cart transport. Though the total number of bullocks in the country is far in excess of the actual requirements, yet their physique and stamina are very poor in most of the States. A large majority of the cattle all over the country

PLAN OF HYDERABAD KITCHEN GARDEN

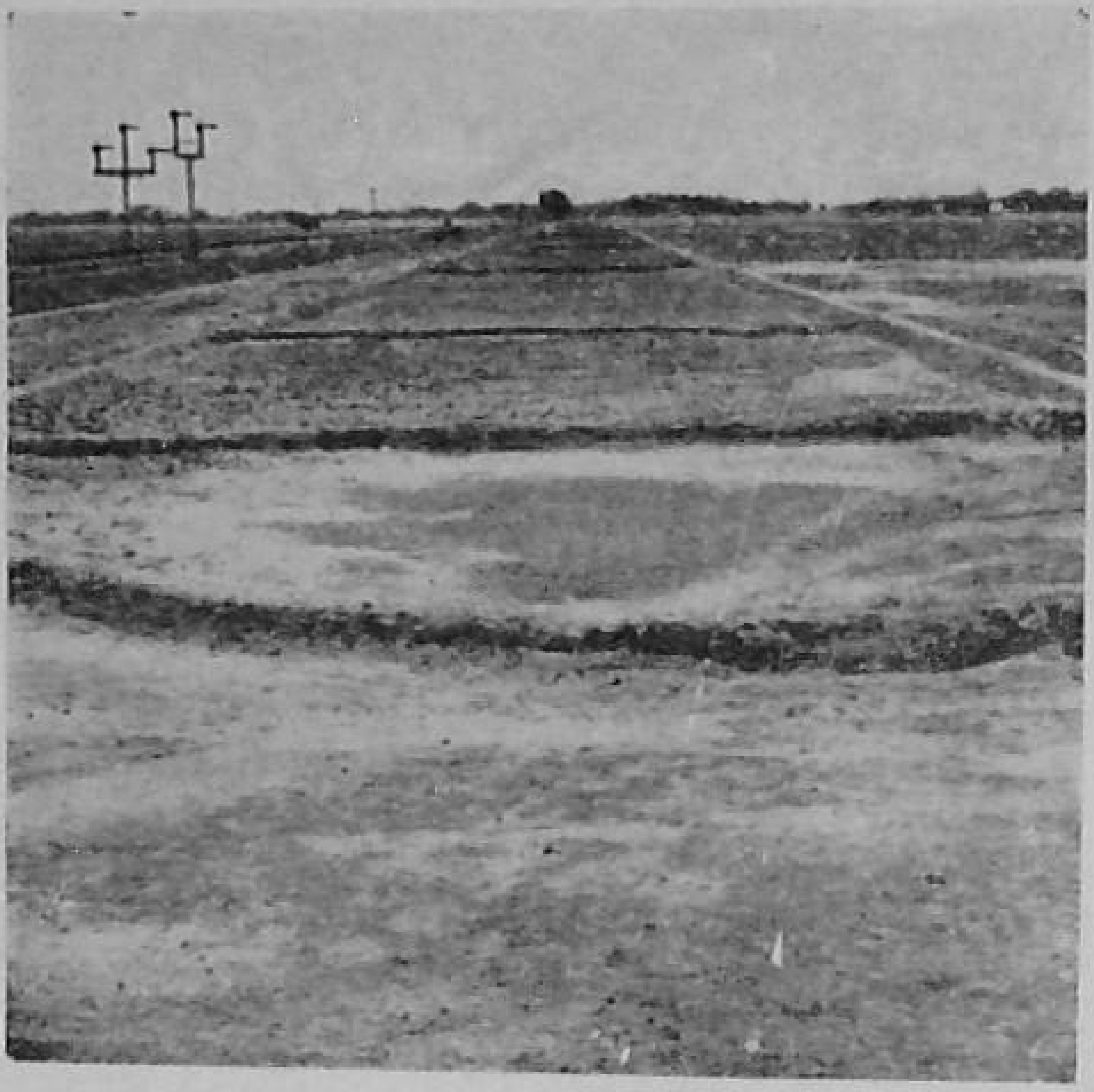


* The figures refer to approximate dates of sowing and final removal of crop.

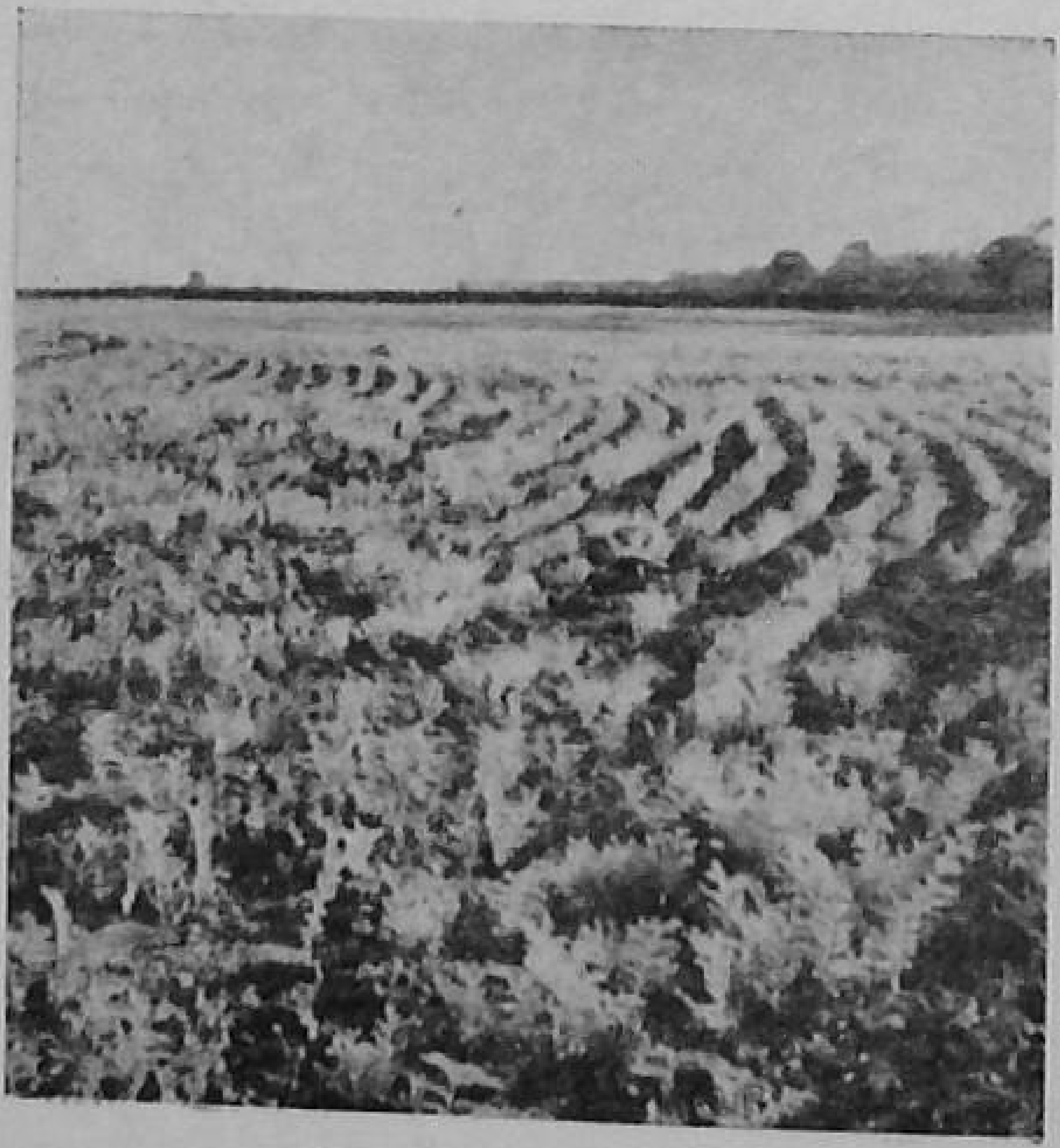
⊙ PAPAYA. × GARDEN TUR. □ TAPIOCA.



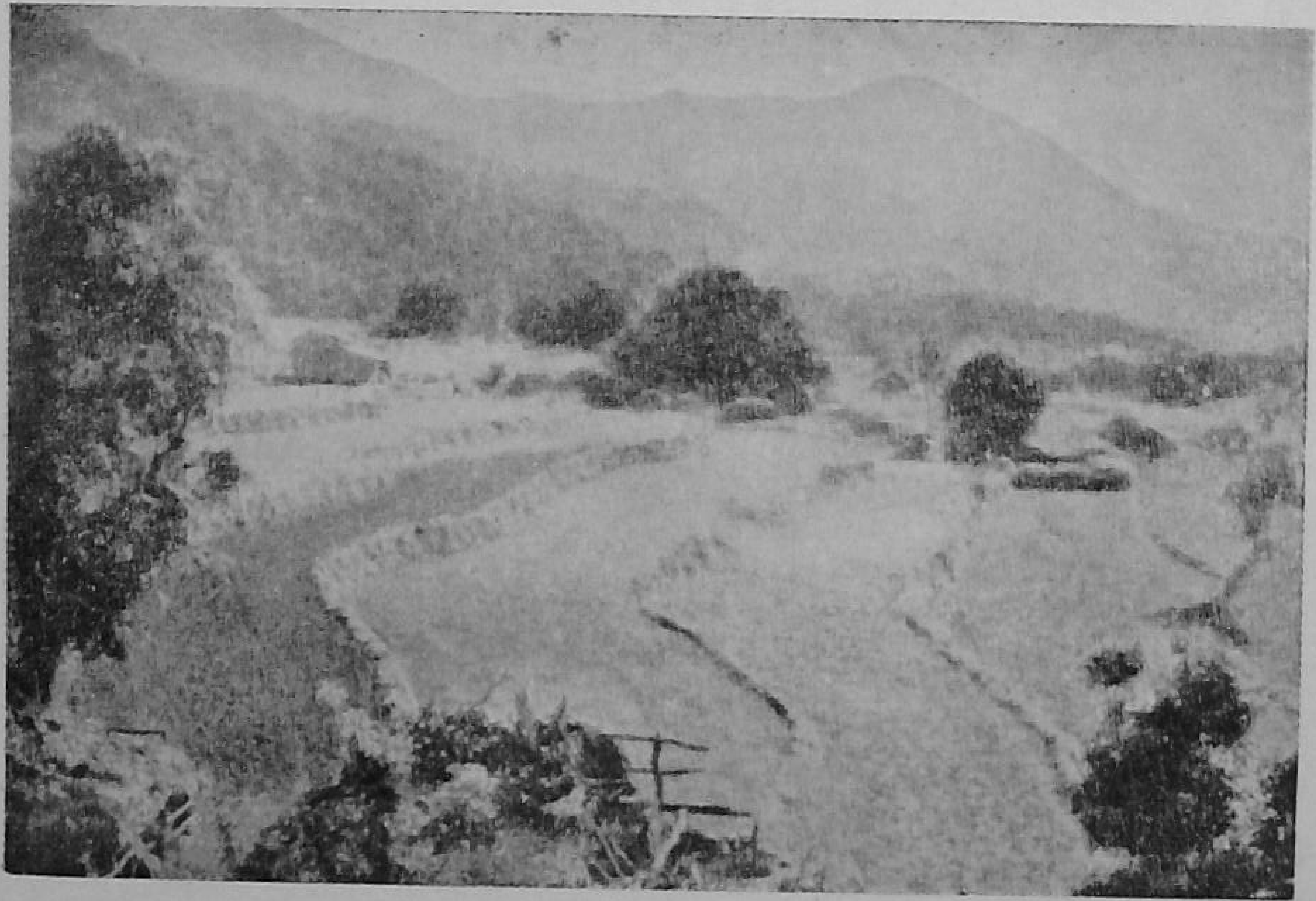
Gully erosion in Jhansi (U.P.)



Compartment bunding for conservation of rain water

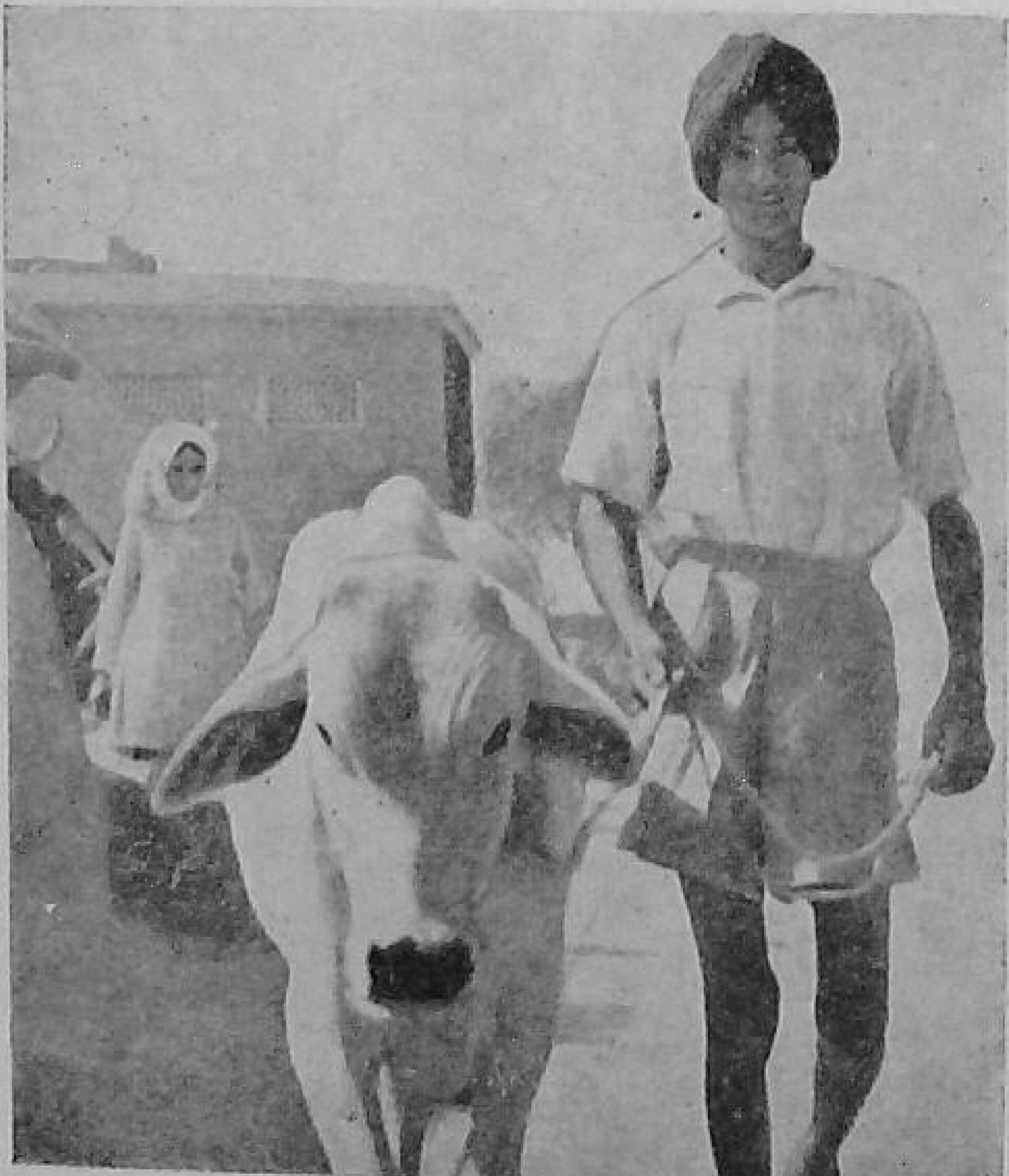


Contour planting

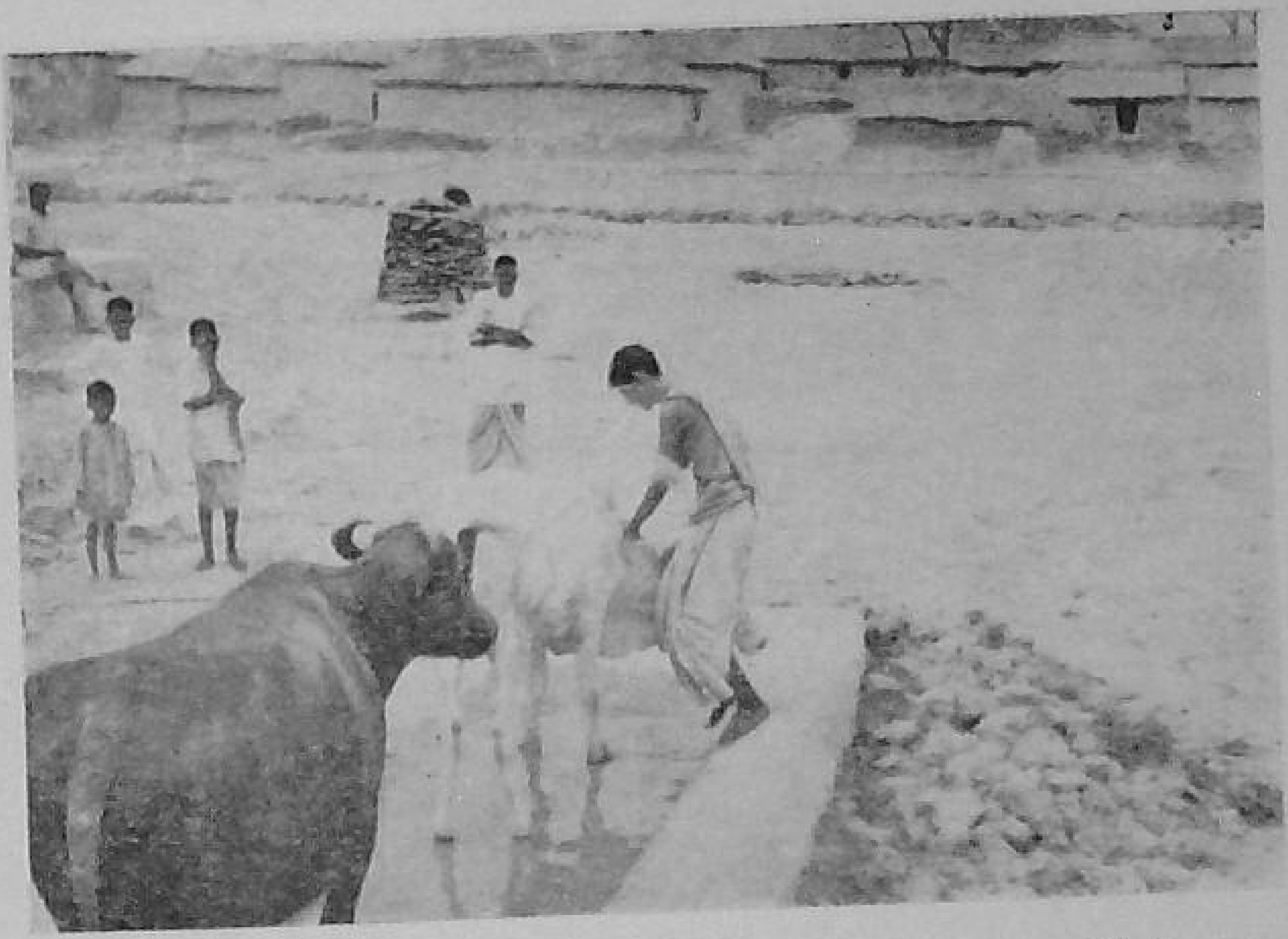


Terraced fields for paddy cultivation in hill tracts

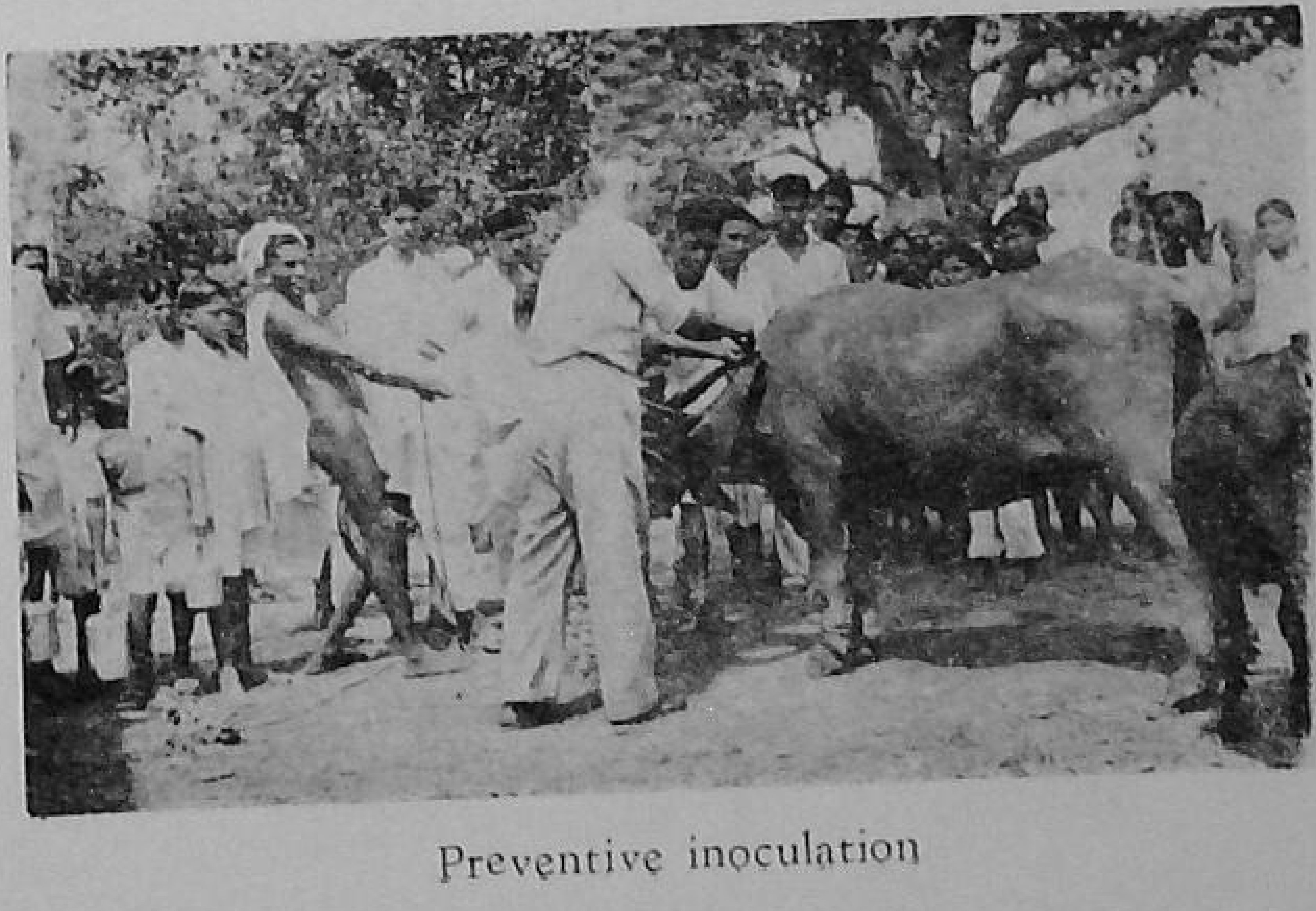
Mother and up-graded calf



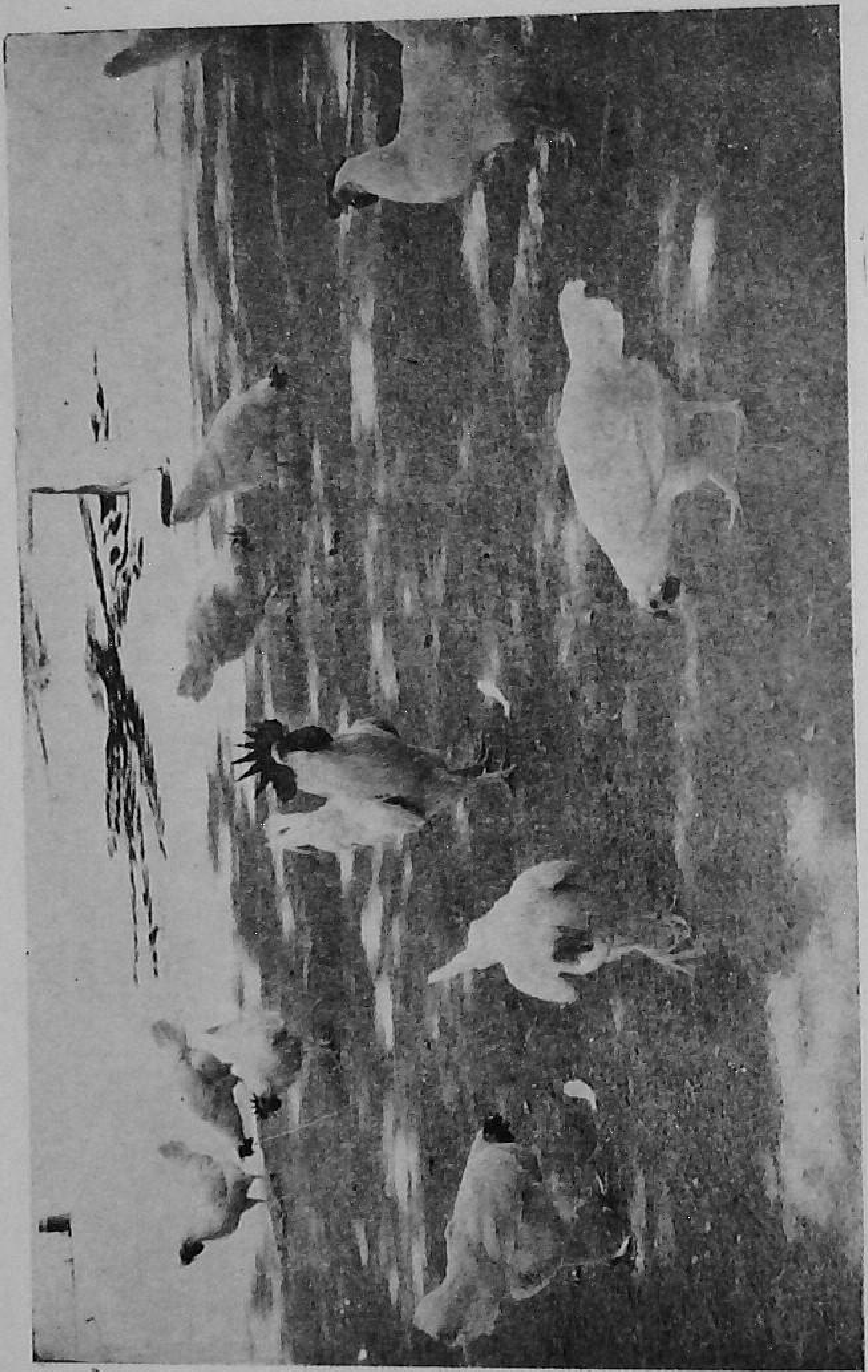
Young farmer proud of his pet



Foot bath for protection against "Foot and Mouth" disease



Preventive inoculation



A flock of white Leg-horns

is of mixed blood due to indiscriminate breeding. It is comparatively recently that a proper cattle breeding policy has been laid down. In respect of some of the States, this policy is still in the making.

The improvement of breed of the cattle is urgently needed for the development of agriculture and dairying The Government of India in the Ministry of Food and Agriculture have sanctioned a number of key-village schemes for the improvement of cattle. In the case of Community Project areas, a special type of key-village unit is recommended which should deal with all aspects of livestock development. This special key-village unit should be established at the headquarter of each Community Project and it should consist of :

(i) a typical key-village centre for cattle, with special reference to collection and marketing of milk ;

(ii) a poultry farm with a small number of birds of improved breeds like White Leg Horn and Rhode Island Red :

(iii) a unit for introducing bee-keeping on cottage industry basis ;

(iv) a unit for improvement of sheep and goats ;

(v) a unit for development of fish ;

(vi) a unit for taking up improvement of pigs ; and

(vii) arrangements for ensuring proper nutritional requirements of live-stock.

[Items (iii) to (vi) are to be taken up wherever feasible].

In villages, other than those included in the key-village scheme, the upgrading work should be conducted by the supply of breeding bulls. The breeding bulls should be of known pedigree and should be purchased from Government cattle breeding farms or reputed private breeders. Suitable arrangements for the feeding and maintenance of the premium bulls should be made with panchayats or private farmers.

In view of the extreme shortage of pedigree bulls in the country, one or more artificial insemination centres should be established in each Development Block. Besides setting up key-village and artificial insemination centres, the State Veterinary Departments should arrange for the examination of the existing bulls in the villages and the certification of the good ones among them for the purpose of mating. All uncertified bulls should be castered or removed to special reserves or *gosadans* maintained for the purpose.

Private breeders, engaged in the production of livestock of good breed, should be given necessary facilities for expanding their work. Such facilities should include the provision of grazing grounds, veterinary aid, land for growing fodder, help in the housing of cattle and facilities for marketing of animals at the best available prices. Loans on easy terms may also be granted to them for the purchase of pedigree bulls and cows. Assistance may be given by making inter-

State arrangements in regard to purchase, transportation and quarantine of pedigree animals imported from one State to another. Provision of such facilities should be subject to the condition that the first option of purchase of their animals would be given to the Animal Husbandry Department of the State concerned. Similarly, conditional subsidies should be given to farmers who would undertake the proper rearing of calves of good parentage. The village youth should also be made to take interest in this work and opportunities should be created for them both by grant of subsidies and award of prizes.

Where legislation requiring the compulsory castration of undesirable bulls does not exist at present, the State Government may be moved to enact and enforce such legislation. Care should be taken to ensure that good bulls for breeding purposes are available in adequate numbers before castration is made compulsory under the law.

12. **Maintenance of cattle in good health** :—The adoption of improved animal husbandry practices to keep cattle in good health is as essential for agricultural development work as the application of improved agricultural technique. The proper care of cattle includes prevention of diseases, medical treatment of sick animals, improved nutrition and better housing.

For prevention of diseases, mass inoculation and vaccination campaigns against rinderpest, haemorhagic scepticemia, black-quarter, etc., should be organised. Legislation for compulsory immunization against infectious diseases should be passed and enforced in the Project areas, if it has not been done so already. For the treatment of sick animals, adequate arrangements should be made for veterinary aid. Where facilities for treatment are not available at present, new dispensaries should be set up with public co-operation. Similarly, mobile dispensaries may be organised for providing first-aid in the villages. The headquarters of Village Level Workers should be equipped as first aid centres and the Village Level Workers should be given necessary training in dealing with ordinary ailments of cattle

Improvement in the feeding of livestock is as necessary as the improvement of breed. Inadequate feeding is the order of the day in a large part of the country. This must be remedied by adopting the following measures :—

(i) increased production of fodder ;

(ii) making oil cakes available in adequate quantities at concession prices, if possible ;

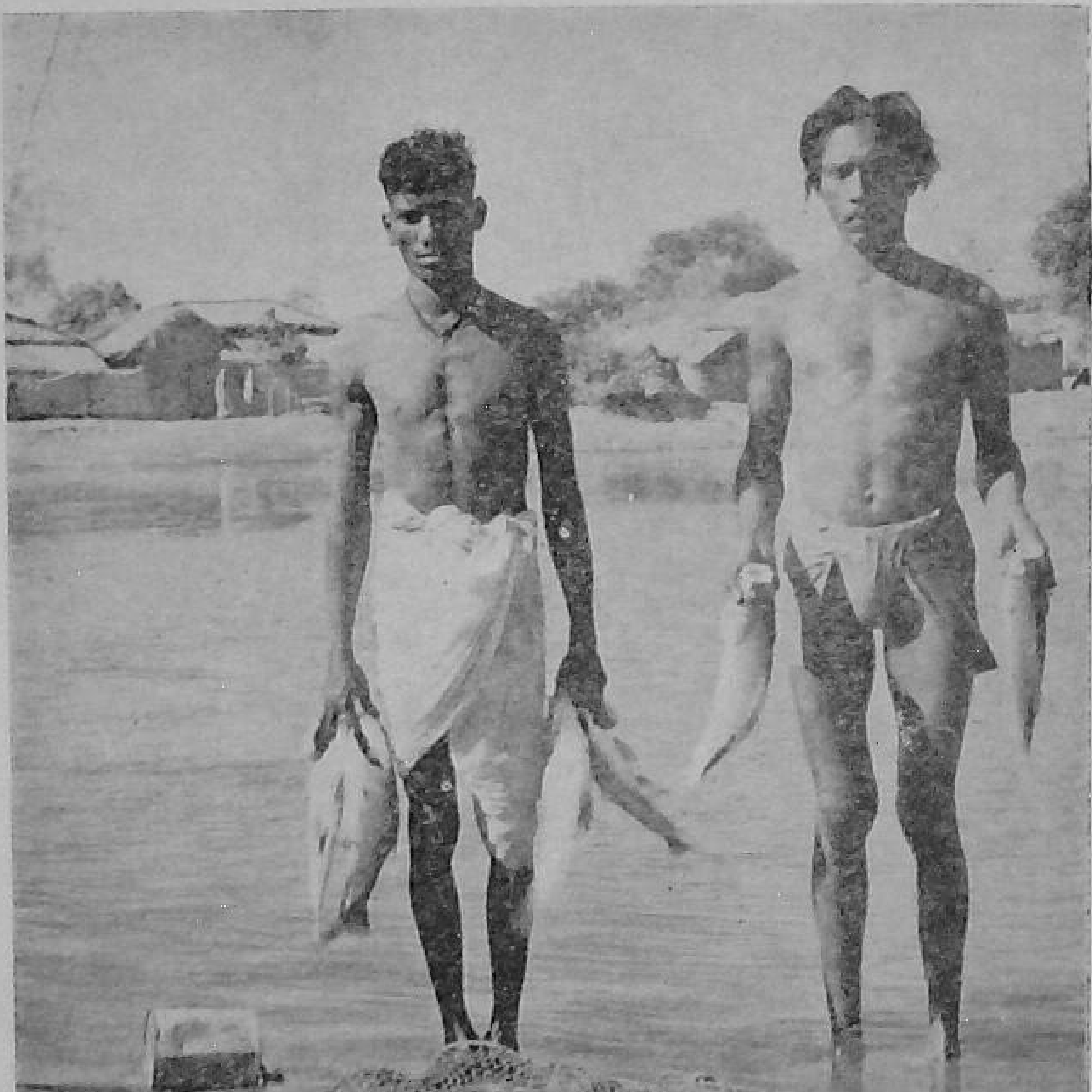
(iii) use of balanced ration for cattle, more particularly in areas where they are at present fed on rice straw only ;

(iv) rotational grazing in village grazing grounds ;

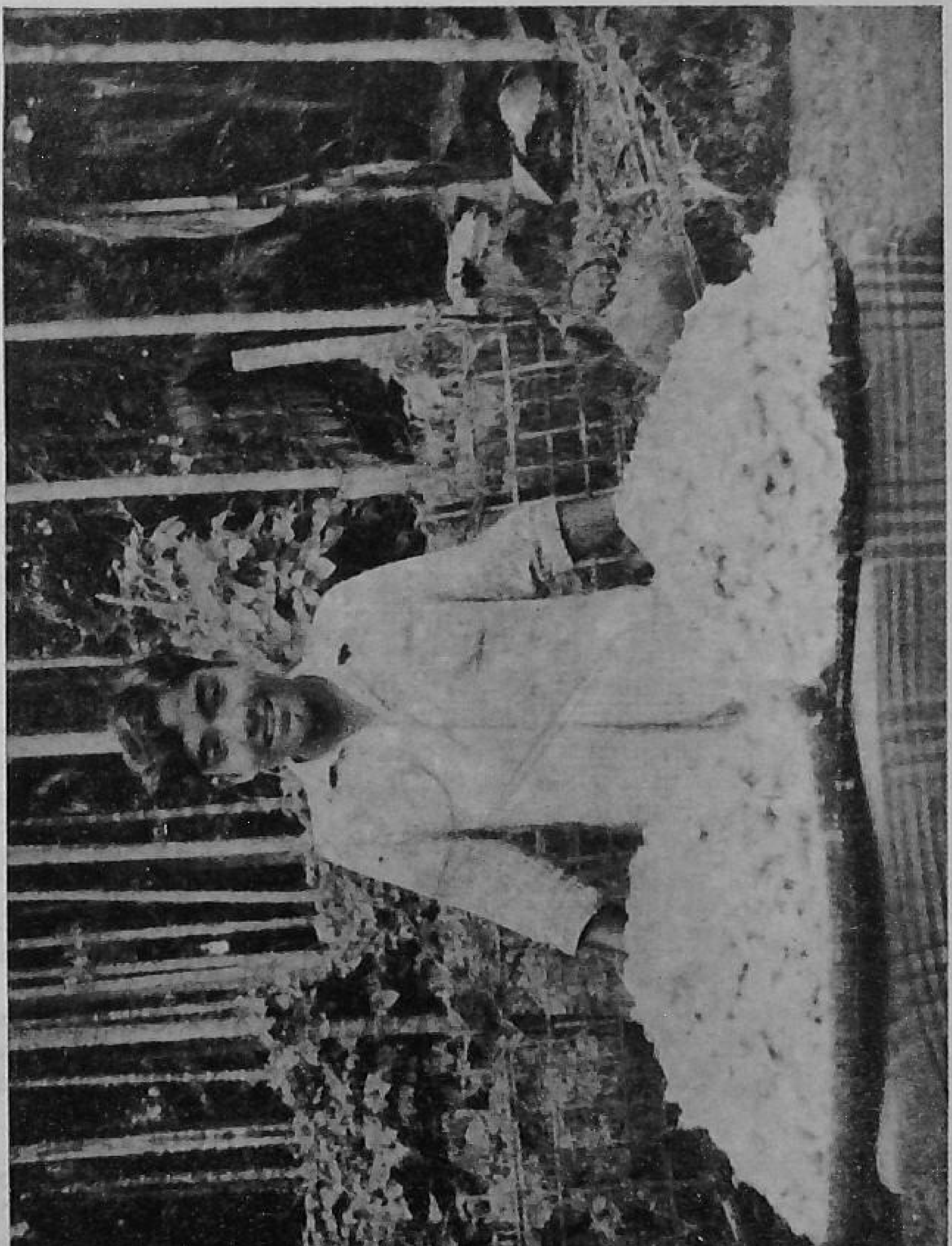
(v) planting of better quality grasses and legumes in pasture lands ;

Flock of sheep

Malpura ewe



A good catch from a village tank



Silk Worm Cocoons

(vi) conservation of surplus green fodder by ensilage and hay-making, and

(vii) providing ample supplies of clean drinking water.

The housing of cattle should be made more hygienic. The cattle sheds should have stone lined or *muram* floors and they should be provided with a drain to carry away urine for use as manure. Adequate protection should be provided to the cattle against both rain and sun. Proper washing facilities should also be arranged for.

13. **Dairying** :—Dairying is an important industry in some parts of Bombay, Saurashtra, Cutch, Punjab and Mysore, and around large cities like Calcutta, Delhi, Patna, Bombay and Bangalore. The suggestions made for the upgrading of cattle and maintaining them in good health also apply to dairy cattle with the proviso that the pedigree bulls for the upgrading of dairy cattle should be of breeds reputed for milk yield. Easy loans should be granted to prospective dairy farmers and all assistance given to them in the purchase of animals of good milking breed. Dairy-men should be given training in the proper care, feeding and upkeep of dairy cows, young stock, dry cows and cows-in-calf. Proper feeding of heifers would also make them conceive reasonably early. The co-operative marketing of milk and milk products should be encouraged. The use of containers that can be easily sterilized should be advocated. The conversion of surplus milk into suitable milk products should also be organised.

14. **Poultry farming** :—In some Projects, particularly in those adjoining large cities, poultry keeping provides supplementary employment as well as income. Poultry farmers in villages usually keep a few birds of mixed *desi* breed and do not take any special care in house-feeding or maintaining them in good health. The birds feed on grain particles lying in heaps of dung and house refuse. Under these conditions, they usually remain undersized and produce only a few, relatively small eggs every year. They also fall an easy prey to infectious diseases. Moreover, many of the chicks die of inadequate protection against heat and cold, or are carried away by cats, jackals, eagles and other birds of prey. The improvement of poultry birds and poultry farming should be taken up wherever possible. Extension and improvement of poultry farming is one of the quickest means of increasing the income of cultivators as well as landless labourers.

The birds of improved breeds like Rhode Island, Red and White Leg Horn are not available in the country in required number. In most of the States, demand is far in excess of supply. To meet the short supply, poultry development work in the initial stages should be concentrated in a few selected villages and the entire stock of *desi* birds should be replaced by the improved breed. An incubator may also be installed for the hatching of eggs at a nominal charge. Such villages can then serve as breeding centres, from which supplies of hatching eggs and chicks may be made to other villages in the Project. The eggs and young birds should be supplied, if possible, at concession rate. Arrangements should also be made for protecting the young birds against infectious diseases like Ranikhet. Campaigns should also be conducted for mass inoculation of adult birds.

In villages, other than 'key-village centres', cocks of improved breed should be supplied for the upgrading of local poultry. In all such cases, *desi* cocks should be removed to ensure mating of the hens with the males of the improved breed only.

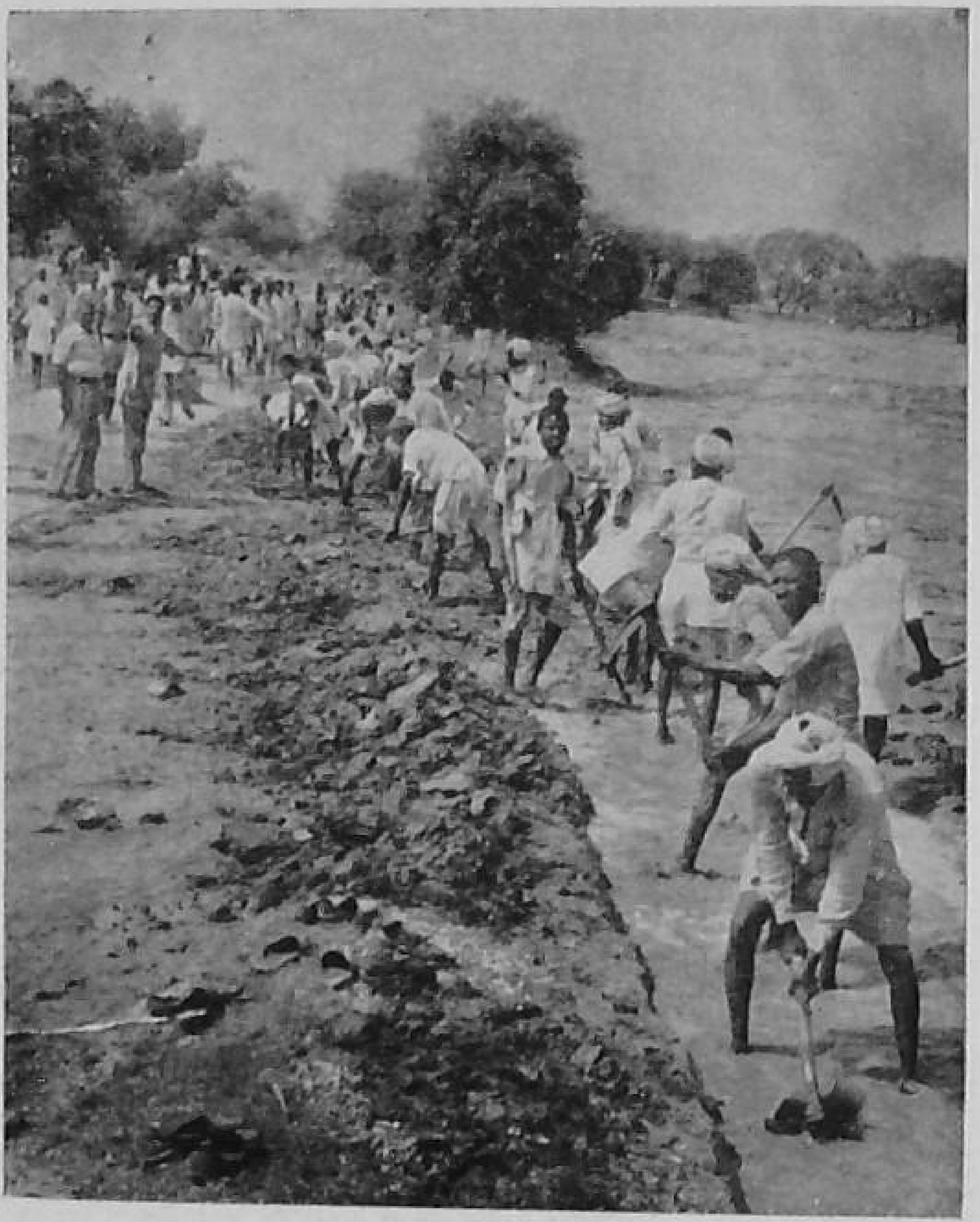
Wherever, possible, children's poultry clubs should be organised to interest boys and girls in poultry farming. These clubs should be worked under the supervision of the village school teachers and the birds may be supplied *gratis* subject to the undertaking that the first 30 or 40 eggs laid by each hen will be supplied to the Project authorities free of cost. Poultry competitions should be arranged for children's poultry clubs and attractive prizes awarded to the children putting up the best exhibits. Help may also be given in the marketing of eggs and birds produced by these children's clubs.

15. **Goats and sheep rearing** :—In areas where goats and sheep are of some importance, the work of upgrading through distribution of good quality bucks and rams should be taken up. Arrangements should also be made for the provision of medical aid. Improved methods of shearing should be demonstrated and encouraged. Finally co-operative arrangements should be made for the proper processing and marketing of fleece.

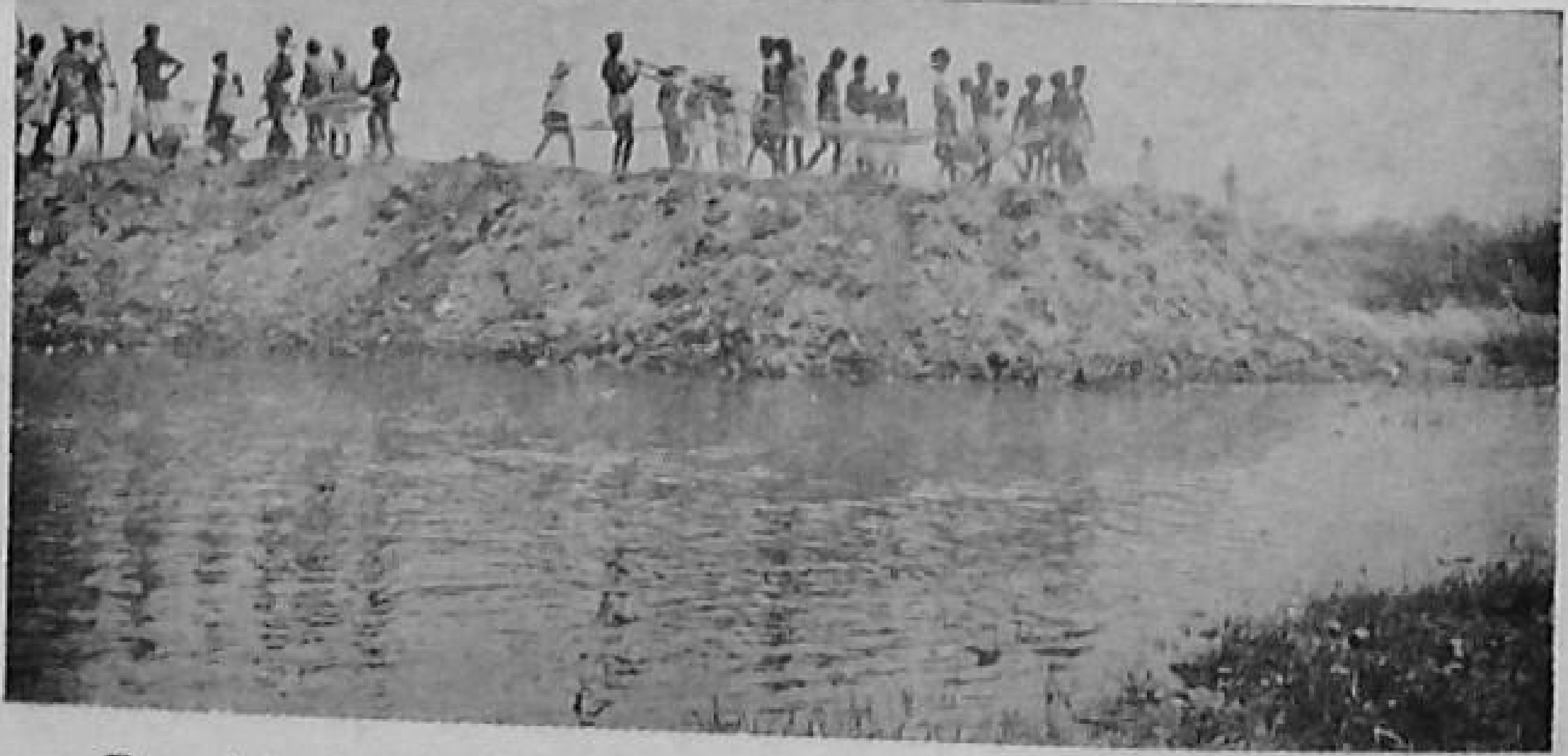
16. **Pisci-culture** :—In the maritime State of Travancore-Cochin and in the coastal areas of Madras, Bombay, Saurashtra, West Bengal and Orissa, where sea fishing provides a livelihood to a large number of persons, improved fishing appliances should be supplied to fishermen. They should also be assisted in the purchase of oil engines to supply motive power for their fishing boats. Further more, assistance should be given for the storage of surplus catch in cold stores ; this will enable fishermen to eliminate temporary gluts in the market and thus sell fish at a stable price.

In Projects where inland fishery offers a good scope for development, active steps should be taken for its promotion. Tanks should be repaired wherever necessary and stocked with large supplies of fingerlings of suitable varieties. Catching of fish as well as its marketing should be properly regulated.

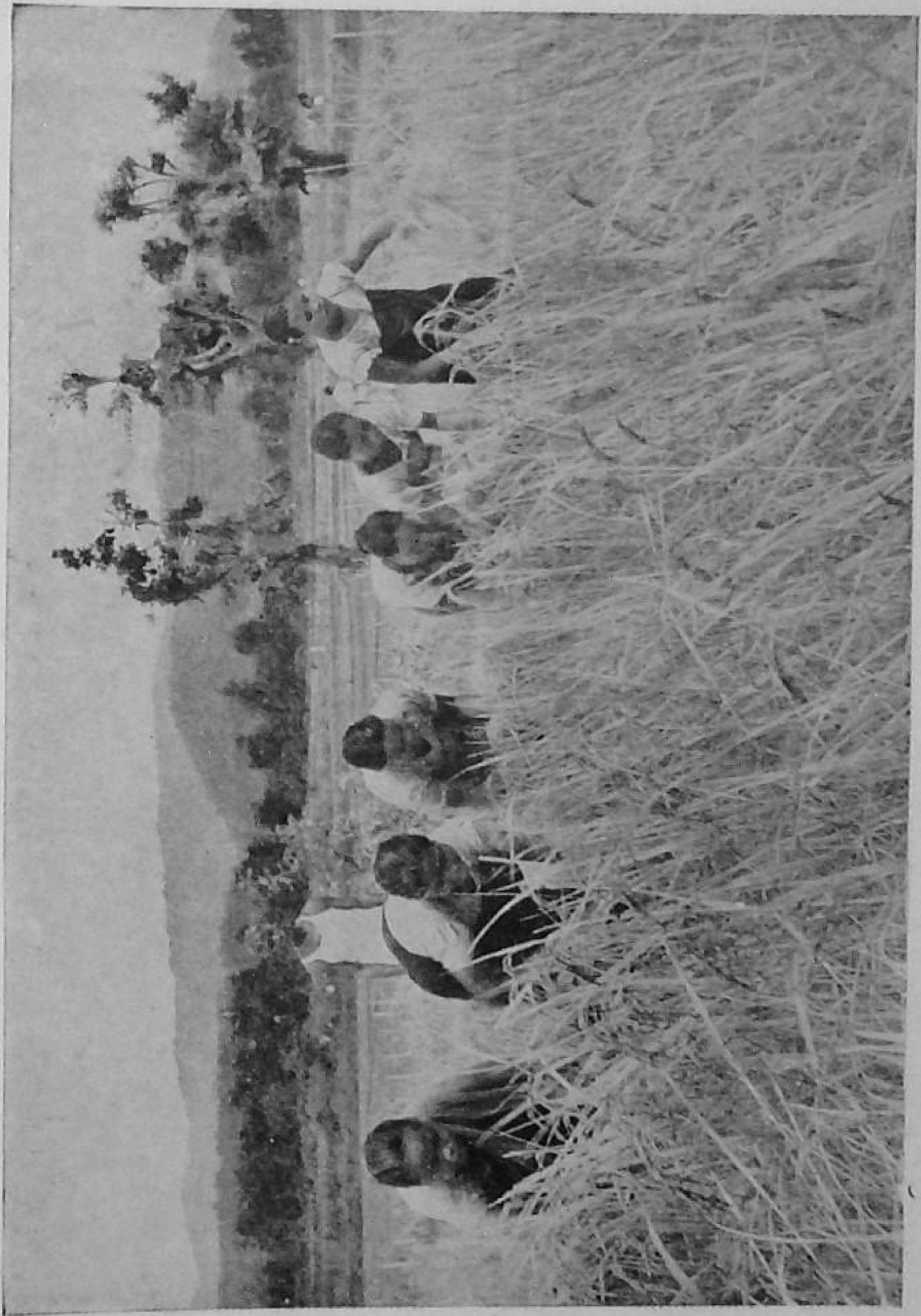
17. **Bee keeping** :—Apiculture not only provides its votary with additional employment and income, but it also increases agricultural production by facilitating pollination in field crops. In Travancore-Cochin, Coorg and the hill tracts of Punjab, Uttar Pradesh and Kashmir, keeping of domesticated bees is an important cottage industry. Similarly, in the forests of some of the tribal areas, collection of wild bees honey is practised on a fairly large scale by the tribal inhabitants. However, in most cases, the methods of rearing bees and collecting honey are rather primitive and capable of being improved. Similarly, processing, packing and marketing practices also leave much to be desired. A certain amount of work has already been done for the improvement of bee-keeping industry in all these tracts and not only the total production but also production of honey per hive have gone up a great deal.



People's participation in desilting of a drain



Repairing a tank-bund in Assam by voluntary labour



School girls helping in harvesting paddy

In Project areas, where bee-keeping offers good possibilities of development, steps should be taken to provide facilities for training in bee-keeping. The supply of colonies of the proper variety of bees and artificial hives and other equipment needed for their rearing should also be made available, and if necessary, payment of the cost by easy instalments may be arranged. Co-operative Societies should be organised for the scientific extraction of honey and its proper bottling and marketing.

18. **Sericulture** :—In the States of Mysore and Kashmir, sericulture is a well developed industry. In some of the other States, rearing of *eri* silk-worms is practised on a fairly large scale. In Project areas, steps should be taken for the expansion of silk worm rearing. Facilities for training in sericulture (including protection of worms against infectious diseases) and supply of worms or eggs, together with the necessary equipment for their rearing, should be organised. Cultivation of mulberry or castor plants, as the case may be, should be extended, and instruction given in the cultivation of these plants. Machinery should also be set up for the collection of cocoons and reeling of silk. The co-operative marketing of cocoons and reeled silk, as the case may be, should be organised, so that the producers of silk secure the best price in consonance with quality.

19. **People's participation—the sine qua non** :—Even under democration conditions, no improvement work can be carried out successfully and on a large scale without co-relating it to a carefully considered programme. A sound agricultural and animal husbandry development programme, is likely to have the largest response, as the fortunes of a vast majority of the people in this country are tied up with the returns from farming. In order that the development programme may secure ready acceptance and enthusiastic support of the farming communities, it should be prepared in full consultation with their representatives. The farmers should feel that it is their own programme. The items included in the programme should be such as would meet their urgent needs. In the assignment of priorities to the different items of work, first thing should come first. In the formulation of the programme, emphasis should be laid on and preference given to such activities as are likely to produce the most outstanding monetary results in the shortest possible time. This will win the confidence of the people in the Governmental and other agencies engaged in agricultural and animal husbandry improvement work. By avoiding the imposition of a programme from outside, the Community Projects will ensure the cultivators' acceptance of the programme as their own. The breaking up of the programme and the fixation of annual targets of increased production for each village and eventually for each farmer will carry this conviction still further.

Barring a few exceptions, agricultural and animal husbandry development work in the past has been largely the result of individual effort supplemented to some extent by Governmental aid. By adopting the new Extension philosophy the Community Projects have introduced a large element of self-help and community effort in development work. Co-operation is secured right from the stage of

the preparation of the programme with the help of the Project Advisory Committees, Panchayats and Village Councils set up for the purpose. Government aid in the execution of the programme is made conditional on active and willing participation by the farmers themselves. Not only this but steps are also taken to obtain the co-operation of the numerous voluntary organisations such as, Bharat Sewak Samaj, Sewa Sadans, Mahila Sabhas, Gram Udyog Kendras, etc. Mass campaigns should be carried out for composting of rural waste, removal of weeds, and protection of cattle against diseases. Similarly, special Camps of Youth Organisations like National Cadet Corps, Boy Scouts, Girl Guides, etc. should be arranged for digging channels and drains, desilting of tanks, planting of trees, etc. Farmer Boys Clubs should be established to secure their participation in activities like poultry farming, calf rearing and fruit and vegetable production. Donations of funds, land, labour, equipment, breeding bulls, should be obtained for construction of minor irrigation works, veterinary dispensaries, cattle improvement centres, seed farms, plant nurseries, village pastures, village markets, etc. Donations of land should also be obtained for community use and for assignment to landless agricultural labourers. Moreover the Project should obtain people's co-operation in the work of consolidation of holdings, economic use of irrigation water and repairs to irrigation tanks and canals in villages. As incentives to increased production, crop competitions should be organised both for individual farmers and villages. Prizes should be awarded to the winners in kind and to villages in the form of public utility structures or community owned machinery. Finally, it may be stressed that all possible opportunities should be created for united effort in the interest of community benefit. Local leadership and initiative should be developed and encouraged at every step.

Note on Integrated Development of Individual Family Holdings

The work of agricultural and animal husbandry development in the past has been based largely on the improvement of separate practices and individual aspects of farming. Demonstrations and propaganda for the improvement of agricultural techniques have been confined at one time to the use of improved seed, at another to the application of chemical fertilizers, and at yet another to some improved cultivation practice for a particular crop. Model projects for the comprehensive improvement of cotton cultivation in selected compact areas were operated in some States for a few years by the Indian Central Cotton Committee, but the work was discontinued by the villagers as soon as the specific schemes were terminated. Work done for the popularisation of the Japanese method of growing paddy during the past two years is the first instance of a concerted country-wide effort for an integrated approach to the all round improvement of the cultivation of a particular crop. Even here the work has been confined to one crop and it does not form part of an integrated comprehensive plan to improve the rice grower's farm or farming as a whole. The simultaneous application of all the recommendations made by the Government Departments of Agriculture and Animal Husbandry to the farms of individual families has not yet been attempted on any large scale. It is very rare that recommendations regarding better land use, proper lay-out of farms, improved cultivation techniques, more efficient agricultural implements, suitable crop rotations, better quality seeds, proper manures and fertilizers, better irrigation practices, new measures of disease and pest control, correct methods of growing fruits and vegetables, taking up of subsidiary activities like poultry farming, bee-keeping, sericulture, dairying and cattle or sheep rearing and primary processing or preservation of surplus agricultutal produce have been applied together in a planned manner on a given family farm. The setting up of 'model holdings' in project areas for a planned all round development of farms owned by individual families to secure year round employment and higher income for their owners is urgently called for. Such model holdings will also show to the farmers in the neighbourhood what results can be achieved by integrated improvement and at what cost.

The following are the principal points that should be given due consideration in the establishment of model holdings :—

(1) Since one of the objects of establishing a 'model holding' is to set an example which an average farmer of the locality would be able to follow, it is necessary to select for this purpose an *average sized* holding and a farmer possessing ordinary resources. Furthermore, the selected farmer should be of a cooperative frame of mind and the holding should not be unduly fragmented or inaccessible. For

its demonstrative value, it is necessary that the villagers should be made to feel that the scheme of the "model holding" is their own scheme and it is to be implemented with the propritiers's own efforts. Therefore, the holding should be selected in consultation with the Village Panchayat or village leaders. If possible, two holdings may be selected in each village, one possessing facilities for growing irrigated crops and the other without irrigation facilities.

(2) The holding selected for development should be surveyed for its area, lay-out, type of soil, pattern of cropping, manures and implements used, agricultural techniques employed, irrigation facilities available, usual farming expenses, existing financial liabilities and economic status (average net annual income).

(3) A proper cropping scheme and a phased development programme covering a period of three years should be prepared for each selected family-holding in consultation with the concerned Deputy Director of Agriculture or the District Agricultural Officer. The cropping scheme should not only include food and cash crops in proper proportion, but it should also cover leguminous and fodder crops. The development plan should include, if necessary, a redesign of lay-out of the farm to provide for better land use, better soil and moisture conservation and greater ease and efficiency of cultivation operations including irrigation.

(4) All crops on this holding should receive adequate manure and optimum cultivation in order to obtain the most remunerative yields. All farm and house wastes should be regularly composted and local resources of manure used to the utmost. Green manuring should be practised periodically. Improved cultivation techniques such as line-sowing or dibbling of crops, Japanese method of growing paddy, furrow cultivation of sugarcane and more frequent interculture of soil in dry farming areas should be adopted. Timely control measures should be taken for effectively dealing with crop pests and diseases. For manufacturing jaggery, an improved furnace should be installed to keep down fuel consumption.

(5) Mixed farming should be practised to provide continuous employment and more varied sources of income. Quick maturing vegetables, garden crops and fruits should be grown. Potatoes, chillies, onion, garlic, yams and ginger which can stand both transport and storage, should be included in the cropping scheme. The growing of perishable vegetable should be spaced in time to ensure orderly arrival and marketing of produce. If the selected holding is in the vicinitly of a town, the maintenance of one or two buffaloes or cows for production of milk may be arranged.

(6) To supplement income from land, poultry farming with improved breed of birds, bee-keeping, sericulture, pig rearing and weaving may be taken up.

(7) Necessary short as well as long-term credit should be made available on usual terms to permit the effective and timely adoption of all remunerative improvements. Supplies of improved seed and fertilizers may be made on *taccavi*, if necessary.

(8) Farm accounts indicating expenses and income should be maintained and annual balance sheets prepared to assess the increased income and the cost incurred.

(9) The fact that the selected holding is also to serve as a model for the average farmer of the locality should never be lost sight of. Low cost of production high yields, no wastage, continuous employment, diversification of sources of income, orderly marketing and proper accounting should be the motto of the "model holding".

VEGETABLE PLANTATION TABLE FOR PLANS

English name of vegetable	Vernacular name	Time of sowing	How to sow	Seed rate per acre	Distance	Seed required for 100 feet row	Average yield per 100, row
Bean French	Vilaiti Sem	August-November	Dibbling in line	8 Seers	1 1/2' x 1'	1 oz	48 lbs
Bean Asparagus	Lobia	May-August	Sow in lines	6 "	5' x 1'	3/4 oz	50 lbs
Country Bean	Sem	June-August	Dibbling in line	8 "	5' x 1'	1 oz	50 lbs
Bitter Gourd	Karela	Jan.-March & June-July	do	3 "	5' x 1'	1/2 oz	185 lbs
Cucumber	Kakri	Feb.-April & May-June	do	1 "	5' x 1'	1/2 oz	90 lbs
Bottle Gourd	Lauki	Feb.-March & June-July	do	2 "	5' x 5'	1 oz	50 fruits
Pumpkin	Kaddu	February-June	do	2 "	5' x 5'	1 oz	40 fruits
Sponge Gourd (ribbed)	Aro-Taroi	February-March	do	3 "	5' x 1'	1 oz	185 lbs
Sponge Gourd (smooth)	Ghia Taroi	July-August	do	3 "	do	1 oz	185 lbs
Snake Gourd	Chachenda	March-April & June-July	do	2 "	do	3/4 oz	185 lbs
Spinach, English	Vilaiti Palak	September-November	Sow in lines	1 1/2 "	1' x 9"	1/5 oz	50 lbs
Spinach, Indian	Desi Palak	July-March	do	1 1/4 "	1' x 1'	1/4 oz	30 lbs
Onion	Pyaz	October-November	do	2 1/2 "	1' x 4"	1/2 oz	100 lbs
Beet	Chukandar	September-October	do	3 "	1' 1/4" x 9"	1 oz	90 lbs
Cabbage	Band Gobhi	September-November	Sow in Nursery & transplant	5 oz	1' 1/2' x 1 1/2'	1/50 oz	45 heads
Carrot	Gajar	August-November	Sow in lines	2 Seers	1' 1/2' x 9'	do	120 lbs
Cauliflower (Accli matised)	Phul Gobhi	June-August	Sow in nursery & transplant	5 oz	2 1/2' x 1'	do	40 heads
Cauliflower (imported)	do	September-October	do	5 oz	do	do	40 heads
Egg-plant (Hot season)	Began	February-Mrach	do	5-6 oz	3' x 3'	1/25 oz	150 fruits
Egg-plant (Rainy season)	Began	June-October	do	5-6 oz	3' x 3'	do	150 fruits
Garlic	Lehsun	October-November	Sow in line	8 Mds	9" x 9"	2 1/4 oz	10 lbs
Knol-Khol	Ganth Gobhi	August-October	do	6 oz	1 1/2' x 1 1/2'	1/4 oz	50 stems
Ladies Fingers	Bhindi	Feb.-March & June-July	do	4-5 Seers	2 1/2' x 1 1/2'	1 oz	800 fruits
Lettuce	Salad	September-November	Sow in nursery & transplant	1 lb	1 1/4' x 1"	1/100 oz	80 heads (50 lbs lear)
Pea	Matar	October-November	Sow in lines	15-20 Seers	2' x 6"	1 oz	28 lb shelled
Potato	Alu	September-November	do	6-10 Mds	2" x 9"	8.16 oz	180 lbs
Radish	Mooli	August-January	do	3 Seers	6' x 4'	1/2 oz	500 roots
T[illegible]ato	Tamatar	June-October	Sow in nursery & transplant	4 oz	3' x 2"	1/20 oz	225 lbs
Turnip	Shaljam	July-November	Sow in lines	2 Seers	1 1/4' x 9"	1/2 oz	110 lbs.

Chart giving Cultivation details of Common Field Crops

English Name	Hindi Name	Sowing Season: North India	Sowing Season: South India	Seed-rate in Seers per acre	Method of Sowing	Spacing	Harvesting Season
Food grains :							
Wheat	Gehun	Oct.-Nov.	October	20-50	Broad cast or Drilled	9″-10″	March-April
Barley	Jao	Oct.-Nov.	October	40-50	-Do-	9″-10″	March-April
Paddy	Dhan	Early: April to June Late: June to July Boro: Dec. to Jan. Deep water: March to April	First Crop : May-June Second Crop: Sept.-Oct Hotweather: Jan.-Feb. Deep water : March-April	Transpt: 5-15 Broadcast:30-50 Deep water: 10-40 Japanese: 5-6 mathas	Broadcast of Transplant	6″-10″	Early: August to Oct. Late: Nov. to January Boto: April-May Deep water : Oct.-Nov.
Maize	Makka	May to July	Un-irrigated: June-July Irrig: Throughout the year.	6-8	Broadcast or in lines	2′ × 1′	June to Sept.
Sorghum	Juar	June-July	Kharif : June-July Rabi, Sept. Oct.	4-5	-Do-	1′-2′ × 1′	Oct.-Nov.
Bullrush millet	Bajra	July-August	June-July	2-3	-Do-	1′-1½′ × 6″-9″	Oct.-Nov.
Minor millet vor Kodou	Kodon	June-July	June-July	3-4	-Do-	1′-1½′ × 4″-6″	September
Minor millet vor Sawan	Sawan	July	July	3-3	-Do-	-Do-	September
Pulses :							
Pigeon Pea	Arhar or Tur	July	June-July	Ditt: 3-4 Drill: 5-6	Dribbled or Drilled	3′-4′ × 2′	Nov.-Dec. and March-April
Gram	Chana	Sep. to Nov.	Oct.-Nov.	30-40	Broadcast or Drilled	9″-10″	March-April
Horse gram	Kulthi	June-July	June-July	14-15	-Do-	12″ × 12″	Sept.-Oct.
Lentil	Masoor	October	October	25-30	-Do-	9″-6″	March-April
Cow-peas	Lobia	June-July	June-July	5-6	-Do-	2′ × 6″	October
Green Gram	Moong	Irrig: April-May Un-irrig: June-July	June-July	6-8	-Do-	2′ × 6″	Early: July-August Late: Sept - October
Peas	Matar	Oct.-Nov.	Oct.-Nov.	25-30	-Do-	1′-1½′	March-April
Black gram	Urd	July	Kharif: June-July Rabi: Sept.-Oct.	6-8	-Do-	2′ × 6″	Khrif: Sept. to November Rabi:February-March

Fibers							
Cotton	Kapas	Irrig: May Un-irrig: June-July	Kharif: June-July Rabi Aug-Sept Hot weather: Dec. Jan. (irrig).	5-8	Broadcast or in lines	18″–36″ × 9″–18″	Kharif: Sept.-November Rabi: January-April Hot weather: June-July
Jute	Jute	Feb. to April to June-July	-Do-	4-5	-Do-	9″ × 6″	
Mesta or Deccan pemf	Patson or ambada	June-July	June-July	12-15	Broadcast or Drilled	12″ × 6″–9″	Sept. to October
Oil Seeds							
Castor	Arand	July to Sept.	June-July	5-6	In line	3′–6′ × 3′–4′	March-April
Groundnut	Moong Phali	May-June	June-July Irrig: Dec.-Jan.	30 (Kernel)	-Do-	11″–24″ × 9″–12″	Oct.-November
Linseed	Alsi	Oct.-Nov.	Sept.-Oct.	10-12	-Do-	1′	February-April
Mustard	Sarson	Sept. to Nov.	Sept.-Oct.	3	Broadcast or in lines	2′ × 9″–1′	February-March
Niger	Ramtil	June-July	June-July	Broadcast: 8-10 Drilled. 2-3	Broadcast or Drilled	1′	Oct.-November
Soff flower	Kusum	October	Sept.-October	4-8	In lines	2′ × 2′	February-April
Sesame	Til	July	June-July	3-4	Broadcast or Drilled	12″ × 6″	Oct.-November
Green Marwas							
Sum hemp	Sanai	June-July	June-July	Fibr: 20-40 G.M : 40	Broadcast	—	Fibre: Sept. G.M.: August
Seibania	Dhaincha	May to July	-Do-	G.M. 30-40	-Do-	—	G.M.: July to August
Fooders:							
Cluster beans	Guar	May to July	June-July	15-20	Broadcast	—	July to October
Egyptian clover	Berseen	Sept.-October	Oct.-Nov.	10-12	-Do-	—	Dec. to May
Elephant grass	Hathi ghas	(i) July-August (ii) Irrig: Feb	June-July	12-15 Mds. (Setts)	In lines	3′–4′ × 2′–3′	Oct.-November
Guinea grass	Do	-Do-	June-July	10-12 Mds. (Setts)	In lines	3′ × 2′	-Do-
Lucerne	Rizqa	Oct.-November	Oct.-Nov.	6-8	Drilled	1½′ × 2′	Dec. onwards
Miscellaneous Crops:							
Sugarcane	Ganna	February	Eksate: Nov. to Feb. Adsate: June to Sept.	45-60 Mds.	Flat or in trenches	2½′–3′ between lines	Nov. to April
Tobacco	Tambaku	Sept. to Dec.	August to October	1 Chatak	transplanted	2′ × 2′	February to May
Sweet Potato	Shakar-qand	-Do-	(i) June-July (ii) Sept.-Oct.	700 to 12,000 Culthys	In lines	3′ × 2′	(i) Nov.-Dec. (ii) February-March

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